Vol. IV, No. 9 SEPTEMBER, 1949

AGRICULTURAL CHEMICALS

In This Issue:

Fertilizer Outlook for 1950 • Insecticide Treatment of Seeds • Problems in Airplane Spraying and Dusting • National Agricultural Chemicals Association Meets • Effect of Sodium Salts of 2,4-D on Economic Plants • Insecticide Resumé of Current Season • ACS Annual Meeting • Use of Eradicant Fungicides for Plant Disease Control • A. Lynn Ivey Dies

Scarce as Hens' Teeth

THE AMERICAN FARMER in 1949 went all-out in relying on organic insecticides to save his crops. In the face of the heaviest insect infestation in many years, growers purchased and applied record tonnages of dusts and sprays.

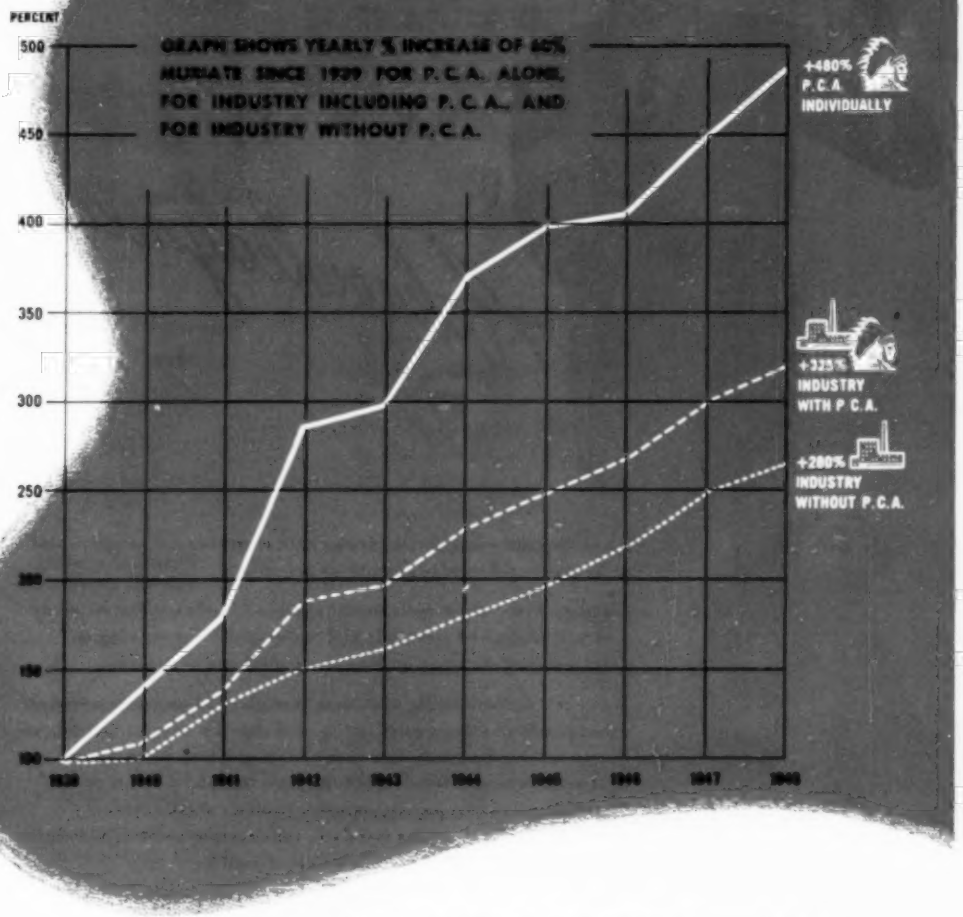
THIS DEMAND was particularly strong for toxaphene. Manufacturers and distributors were hard pressed to supply many sections of the country where toxaphene ranked as the No. 1 choice. Toxaphene dusts and sprays were in strongest demand to combat the peak invasions of grasshoppers, cotton insects, salt marsh caterpillars and armyworms.

THE EFFECTIVENESS of toxaphene insecticides and their increasing acceptance by the American farmer were conclusively demonstrated this past season. Hercules Powder Company, the maker of technical grade toxaphene, is increasing its manufacturing facilities at Brunswick, Georgia, so that the ever-widening field of recommended uses for toxaphene may be adequately supplied in 1950.

HERCULES POWDER COMPANY

970 Market Street, Wilmington 99, Delaware

We've been doing some figuring...



1948 was a record year for domestic Potash. Using '39 as a base, the industry—not including P.C.A.—showed an increase of 280% in 60% Muriate. P.C.A. production lifts the industry increase to 325%. ***P.C.A. alone shows a High Grade Muriate increase for the same period of 480%.***

95% of all P.C.A.'s '48 deliveries were in the form of 60% Muriate. Our new $4,000,000 production and refining facilities now are operating. Our deliveries for '49-'50 will break all previous records. In fact, P.C.A.'s production capacity for 60% Muriate this year will exceed by some 150,000 tons the entire potash consumption—all grades—of the nation ten years ago.

These figures are graphic evidence of the leadership P.C.A. has won . . . leadership in volume, in economy to you and to agriculture.

P.C.A. The SALT of the EARTH RED MURIATE

Potash Company of America

Carlsbad, New Mexico

GENERAL SALES OFFICE . . 50 Broadway, New York, N. Y. ● MIDWESTERN SALES OFFICE . . First National Bank Bldg., Peoria, Ill
SOUTHERN SALES OFFICE . . Candler Building, Atlanta, Ga.

BY WAY OF

Acknowledgment...

Another growing season draws to a close—and it is appropriate to get some acknowledgments on record.

Plaudits, first, to the agricultural chemicals industry for its many new and improved materials and techniques—for serving to pests a diet of destruction that saved millions of dollars.

Many thanks for buying and using Attaclay* in unprecedented tonnages. We've been told and re-told that our carrier and diluent did an outstanding job. It met the most exacting formula and field requirements. It was used, to great benefit, with all of the popular poisons in just about every product classification. It reshaped ideas—in the minds of concentrate makers, blenders, and growers—of what a quality dust should be.

Nor are we less grateful to customers who met us a good half-way when demand for Attaclay hit unpredictable peaks, imposing severe strains on our facilities. With the chips down, our actual output went well beyond rated capacity.

As for Attaclay in 1950, work is under way on new plant equipment to greatly expand the production of this carefully manufactured and controlled product. In other words, we mean to accept the responsibilities as well as feel the pride of having a good product.

ATTAPULGUS CLAY COMPANY

Dept. P, 210 West Washington Square, Phila. 5, Pa.

AGRICULTURAL CHEMICALS

THIS MONTH'S COVER

Sulfur unloading dock at Everett, Mass. plant of Monsanto Chemical Co. Sulfur is shipped by water from Galveston, Texas, and unloaded directly onto the plant site from the Mystic river. (Photo courtesy of Monsanto Chemical Co.)

SEPTEMBER 1949
VOL. IV No. 9

In This Issue:

Editorials	23
Problems in Airplane Spraying *by* KENNETH MESSENGER	25
Insecticide Treatment of Seeds *by* G. S. HENSILL	29
Fertilizer Outlook for 1950 *by* L. G. PORTER	31
Resume of Insecticides for 1949 *by* MELVIN GOLDBERG	35
Nat'l Agri. Chemicals Association Meets	38
Use of Na Salts of 2,4-D *by* EILEEN BRENNAN AND IDA A. LEONE	40
Listening Post *by* G. J. HAEUSSLER AND PAUL R. MILLER	45
Suppliers' Bulletins	51
Technical Briefs	53
Industry News	57
Fertilizer News	67
Industry Patents	87
Classified Advertising	88
Advertisers' Index	89
Tale Ends	90

A Monthly Magazine For the Trade

•

LAWRENCE A. LONG
Editor

THOMAS MORGAN
Advertising Manager

•

Editorial Advisory Board . . .

DR. ALVIN J. COX
Palo Alto, Calif.

LEA S. HITCHNER
Washington, D. C.

DR. L. W. KEPHART
Beltsville, Md.

DR. S. E. A. MCCALLAN
Yonkers, N. Y.

DR. CHARLES E. PALM
Ithaca, N. Y.

DR. S. A. ROHWER
Washington, D. C.

DR. COLIN W. WHITTAKER
Washington, D. C.

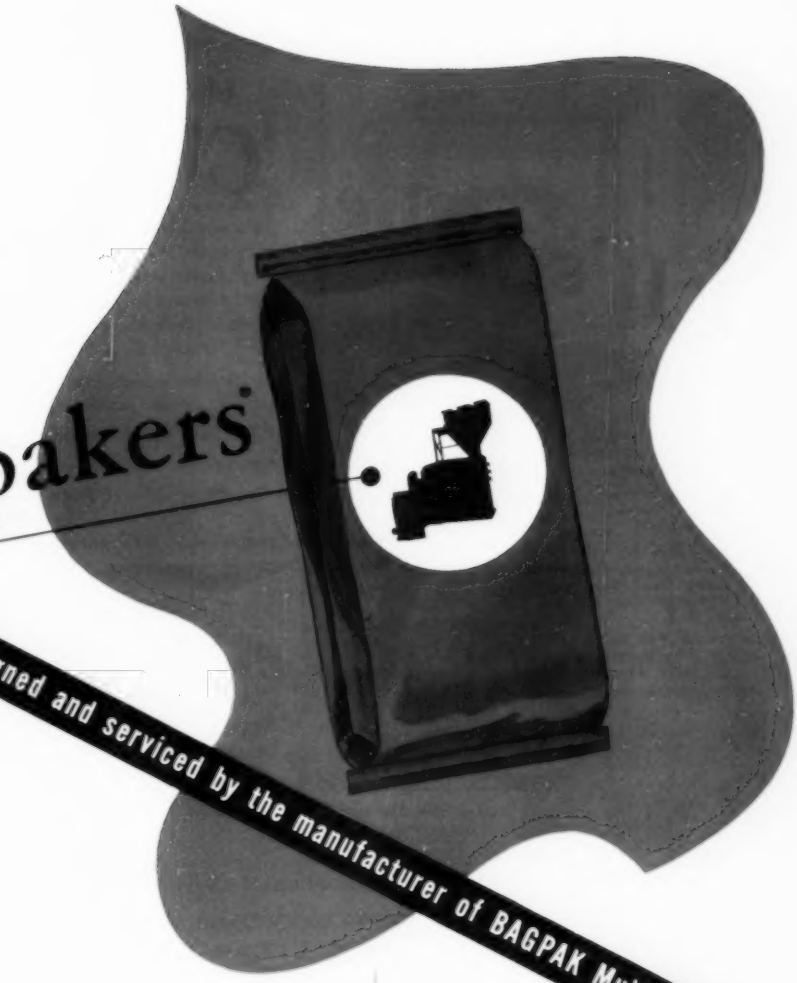
AGRICULTURAL CHEMICALS

Subscription Rates: *One year,* $3.00, *two years* $5.00. *Outside U. S. one year,* $4.00. *Published monthly on the 15th by Industry Publications, Inc. Publication office 10 McGovern Ave., Lancaster, Pa. Advertising and editorial office 254 W. 31st St., New York 1, New York. Advertising rates made known on application. Closing date for copy—20th of the month previous to date of issue.*

Entered as second-class matter June 22, 1949, at the Post Office at Lancaster, Pa., under the Act of March 3, 1879.

NOW! protect truck crops with
KRYOCIDE
NATURAL GREENLAND CRYOLITE
• Not acutely toxic to warm blooded animals
• Non-phytotoxic to most crops
• Economical
• Efficient
• Easy to use as dust or spray
• Compatible with non-alkaline fungicides
• Stable—will not deteriorate
KRYOCIDE controls these garden pests:
Mexican Bean Beetle
Cabbage Worm
Cucumber Beetle
Tomato Pinworm
Squash Vine Borer
Tomato Fruitworm
Cranberry Fruitworm
Flea Beetles
Melon Worm
Pickle Worm
and many others
Thousands of truck farmers are again using Kryocide—the natural Greenland cryolite insecticide—to combat the ravages of chewing insects. Kryocide is safe to use, it will not harm humans and is safe on practically all crops . . . Easy to apply as a dust or a spray.
Cryolite is also recommended for such crops as peanuts . . . and the hay may be used for forage following harvest.
For truck crops or other uses Kryocide alleviates an increasingly important residue problem.
Kryocide has been proven through years of use as a safe, dependable and effective insecticide. Take advantage of our technical service. Write for Kryocide booklet: Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa. • Bryan, Texas • Tacoma, Washington.
PENN SALT
agricultural chemicals
Other PENCO Insecticides include:
• DDT Compounds
• Parathion

Bagpakers



designed and serviced by the manufacturer of BAGPAK Multiwall Bags

Who but a manufacturer of multiwall paper bags is best equipped to design and service bag packaging machinery?

Automatic advantages of faster, more efficient packaging come with automatic BAGPAKERS . . . that's why we say —

if you want a packaging machine that sews a multiwall tighter and faster – rely on a BAGPAKER . . .

if you want an automatic machine that weighs, fills, settles and seals better – rely on BAGPAKER . . .

if you want a real performer – a dependable machine that boosts and maintains production rates – rely on BAGPAKER.

BAGPAKERS and Bagpak Multiwall Bags are ideal for packing food, chemicals and fertilizers. Write for our booklet 200B—it will give you added information on these money- and labor-saving machines and multiwall bags.

BAGPAK DIVISION

INTERNATIONAL PAPER COMPANY, Bagpak Division
220 East 42nd St., New York 17, N. Y.

BRANCH OFFICES: Atlanta, Baltimore, Boston, Chicago, Cleveland, Baxter Springs, Kansas, Los Angeles, New Orleans, Philadelphia, Pittsburgh, St. Louis, San Francisco.

In Canada: Continental Paper Products, Ltd., Montreal, Ottawa

It's The Climate!

DIRECTORS

W. C. BENNETT
President, Phelps Dodge Refining Corp., New York.

J. HALLAM BOYD
Exec. Vice President, Commercial Chemical Co., Memphis, Tenn.

ERNEST HART
President, Niagara Chemical Division, Food Machinery & Chemical Corp., Middleport, N. Y.

LEA S. HITCHNER
Executive Secretary, NAC Association, Washington, D. C.

GEORGE F. LEONARD
Exec. Vice President & Treas., Tobacco By-Products & Chemical Corp., Richmond, Va.

A. W. MOHR
President, California Spray-Chemical Corp., Richmond, California.

JAMES McCONNON
Vice President, McConnon & Co., Winona, Minn.

E. H. PHILLIPS
Director of Purchasing, GLF Soil Building Service, a Division of Co-operative GLF Exchange, Inc., N. Y.

FRED SHANAMAN
President, Pennsylvania Salt Manufacturing Co., Tacoma, Wash.

RUSSELL R. STODDARD
Coordinator of Insecticide Operations, U. S. Industrial Chemicals, Inc., New York.

F. S. WASHBURN
Director, Agricultural Chemicals Division, American Cyanamid Co., New York.

BYRON P. WEBSTER
Vice President, Chipman Chemical Co., Inc., Bound Brook, N. J.

F. W. WIEDER
Western Division Manager, Stauffer Chemical Co., San Francisco, California.

YOU live and do business in an ever-changing climate—a climate that is continuously shifting as your products and actions are weighed and voted upon by people everywhere.

Your climate is the sum total of the opinions of:

Customers
General Public
Government

A daily vote of confidence from all three is essential for continued success.

The many services of NAC—Technical, Legislative, Legal, Information—aid NAC members plan their operations to the end that the public and agriculture reap the full advantages of scientific agriculture.

★ ★ ★

National Agricultural Chemicals Association

. . . Formerly the AIF Association

Barr Bldg., 910 17th St., N.W. Washington 6, D. C.

OFFICERS

GEORGE F. LEONARD, *President*

A. W. MOHR, *Vice-President*

LEA S. HITCHNER, *Executive Secretary and Treasurer*

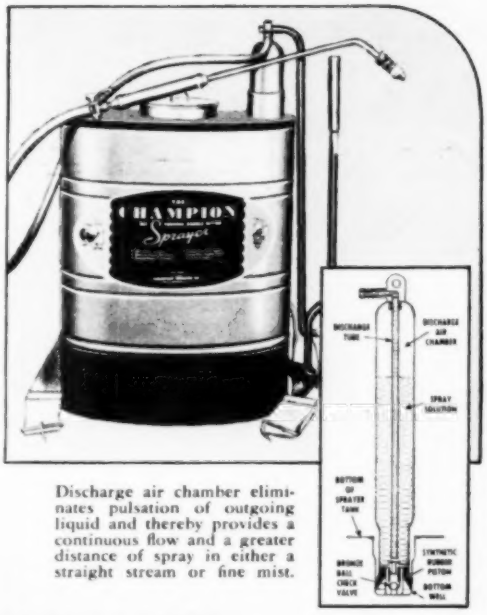
For Spraying Well Done . . .

The CHAMPION

PORTABLE, ALL-BRASS SPRAYER

Wherever there is any amount of spraying of any liquid, solution or acid to be done, you can do it well and quickly with the Champion hand-powered, knapsack sprayer. It is the product of more than a quarter century of scientific development, precision manufacture, and experimentation with leading colleges and growers. Many thousands are in daily satisfactory use throughout the world.

The Champion is the one unit that combines all the desirable qualities of unusual power, simple operation, effective control, continuous agitation, and long life.

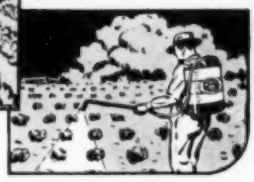


Discharge air chamber eliminates pulsation of outgoing liquid and thereby provides a continuous flow and a greater distance of spray in either a straight stream or fine mist.

Champion fits snugly on operator's back as he walks through greenhouse spraying to right or left, up or down.

Here's power to reach trees as high as 35 ft.

Reach under lowest plants without bending over.



Cover large area of crops quickly and effectively.

SPECIAL CHAMPION BOOM for FAST WEED SPRAYING

For effective weed control, use Champion with concentrated weed killer solution and Boom No. 89. Boom has two Tee-Jet non-corrosive nozzles equipped with 100-mesh screen. Operator can spray path 36" wide wherever he can walk at rate of 4 gals. of concentrated solution per acre.

Champion is an all-purpose, portable sprayer. With it you can spray

INSECTICIDES • FUNGICIDES • ACIDS • OIL • DDT
WATER PAINT • WEED KILLER SOLUTIONS

Virtually any liquid can be used without affecting the synthetic rubber piston and the non-corrosive brass parts. There can be no clogging of the nozzle because the liquid is filtered twice and kept well agitated. Tank is all-brass. Pressure is confined to the piston cylinder, which is made of heavy, seamless brass tubing. Champion flexibility enables you to spray a fine mist or a 35-foot stream up, down, or in any direction. Form-fitting tank is held comfortably on operator's back by adjustable straps.

For Distributors Name and Free Literature Write To:

CHAMPION SPRAYER CO. 6541 Heintz Ave. DETROIT 11, MICH.

Manufacturers of Portable Sprayers and Dusters

Champion Sprayer Co.
6541 Heintz Ave., Detroit 11, Mich.

Mail Now for Complete Details

Please send me without obligation free literature and prices on

( ) Sprayer No. 1 ( ) Complete Line of Sprayers and Dusters

We are ( ) interested ( ) As possible user ( ) In re-selling

I am

Firm Signed

Address

City State

★ *Profit-Protected with*

SWAN BRAND FUMIGANTS

Made in five different formulations to assure dependable results under all conditions, Swan Brand Fumigants provide positive control over grain weevils, rice weevils, lesser grain borers, confused flour beetles, angoumois grain moth larvae, Indiana tooth larvae, cadelle, black carpet beetles, saw tooth grain beetles and similar pests.

FUMIGAS—Dependable all-purpose grain fumigant for large or small storage bins, elevators, warehouses and box cars.

SPOT FUMIGANT—(15% Ethylene Dibromide by volume) For local control in boots, reels, conveyors, spouts or infested bags and products to supplement general plant and grain fumigation.

FUMIGANT NO. 2—Ethylene Dibromide 5% by volume) Complete penetration controls grain pests at top, center and bottom of bins.

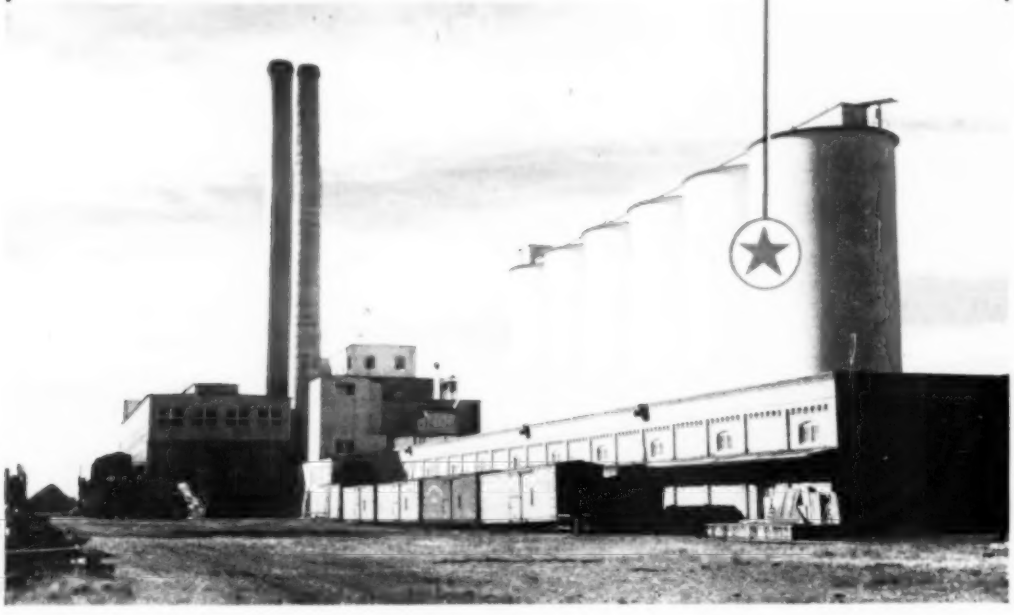
CONTACT SPRAYS—For storage containers prior to use. Use Swan Brand Contact Spray (non-toxic) or Ded-Tox Residual Spray (DDT base) at rate of 1 gal. per 1000 sq. ft.

PERMITTED AND APPROVED BY MILL MUTUAL FIRE PREVENTION BUREAU

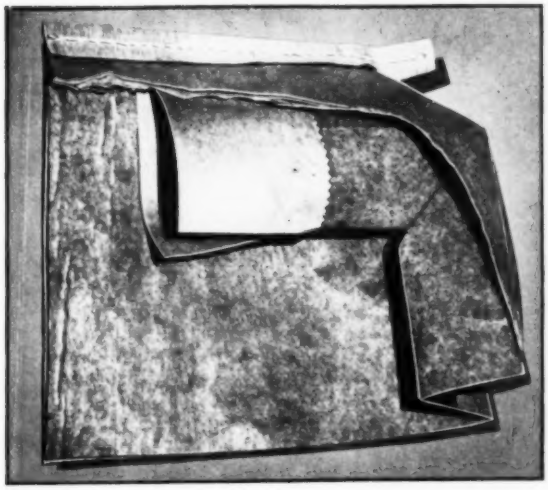
THOMPSON-HAYWARD CHEMICAL CO.

KANSAS CITY, MISSOURI

MINNEAPOLIS	OKLAHOMA CITY	N. LITTLE ROCK	SAN ANTONIO		CORPUS CHRISTI
DES MOINES	DAVENPORT	NEW ORLEANS	ST. LOUIS	HOUSTON	DALLAS
WICHITA	MEMPHIS	CHICAGO	OMAHA	DENVER	TULSA



NOT 1 BUT 2 EXCLUSIVE FEATURES

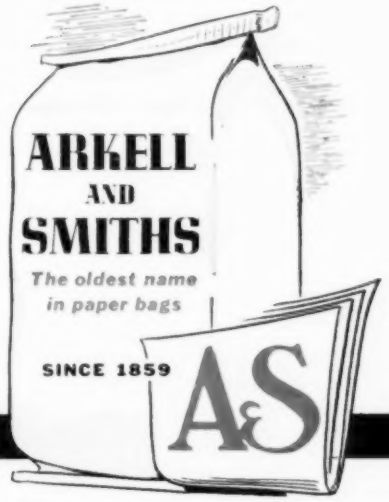


1 Less dusting when packing.

2 Less sifting when packed.

STUDY THIS cutaway illustration of the SHUR-CLOSE Valve Bag. The overlapping action at the top of the bag channels the material into the bag to give less dusting while filling. The two-way action of the valve comes when bottom section of valve crosses over giving quick, complete seal after bag is filled.

Plant demonstration runs have convinced scores of fertilizer and chemical manufacturers of these two advantages of SHUR-CLOSE Valve Bags over ordinary valve bags. Call or write our nearest office for a demonstration of the SHUR-CLOSE Valve Bag in *your* plant using *your* filling machines.



CANAJOHARIE, N. Y. · WELLSBURG, W. VA. · MOBILE, ALA.

MESSINGER DUSTERS

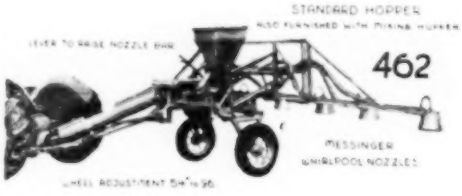
DUST MIXERS • SEED TREATERS

IN 12 SIZES • 200 MODELS

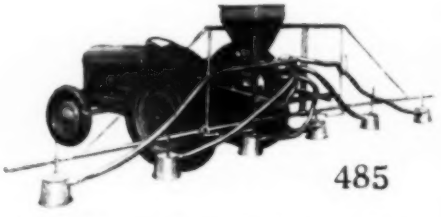
Hand Dusters

Traction Dusters in four sizes for all crops.

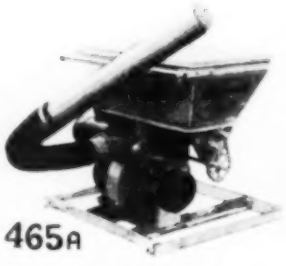
Model "SH" 1 Mule Walking Duster.



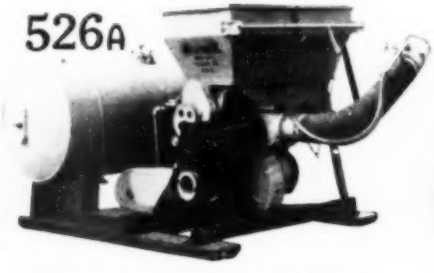
Tractor Trailer Dusters for Crops and Trees.



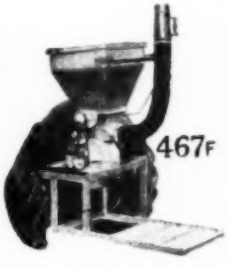
Tractor Mounted Dusters for Crops and Trees for practically all makes of tractors.



Engine Powered Tree Dusters.



Combination Sprayer Duster also furnished on Cart.



Tractor Mounted Tree Dusters.

FOR INFORMATION CALL YOUR DISTRIBUTOR OR WRITE TODAY TO

MESSINGER MFG. CO. TATAMY, PA. U.S.A.

Reduced Packaging Costs...

...part of the 2¢ per pound you save by using CELITE* in your primary grinds

THE USE OF CELITE* 400 may save you up to 2¢ per pound on every pound of toxicant you grind. You'll find that Celite's high absorption properties permit grinding of higher concentrate poisons . . . and that the net result is lower costs all along the line.

Here are some of the ways in which Celite 400 can help you save:

Reduced grinding costs: Because of Celite's higher liquid absorption properties (more than twice its weight of water), you can grind up to 70% DDT mixtures. High concentrates of BHC and other low melting point poisons may also be ground with Celite.

Reduced packaging costs: The higher strength primary grinds made possible by the use of Celite 400 enables the packaging of more toxicant per unit package.

Reduced storage and shipping costs: These highly concentrated primary grinds produced by the use of Celite 400 ship and store more economically.

In addition to economy, Celite 400, used as the sole primary grinding aid, gives greater kill power to the toxicant. As the absorbing agent for liquid poisons, too, Celite 400 produces highly concentrated dry dusts at the lowest possible cost. For further information, write Johns-Manville, Box 290, New York 16, N. Y.

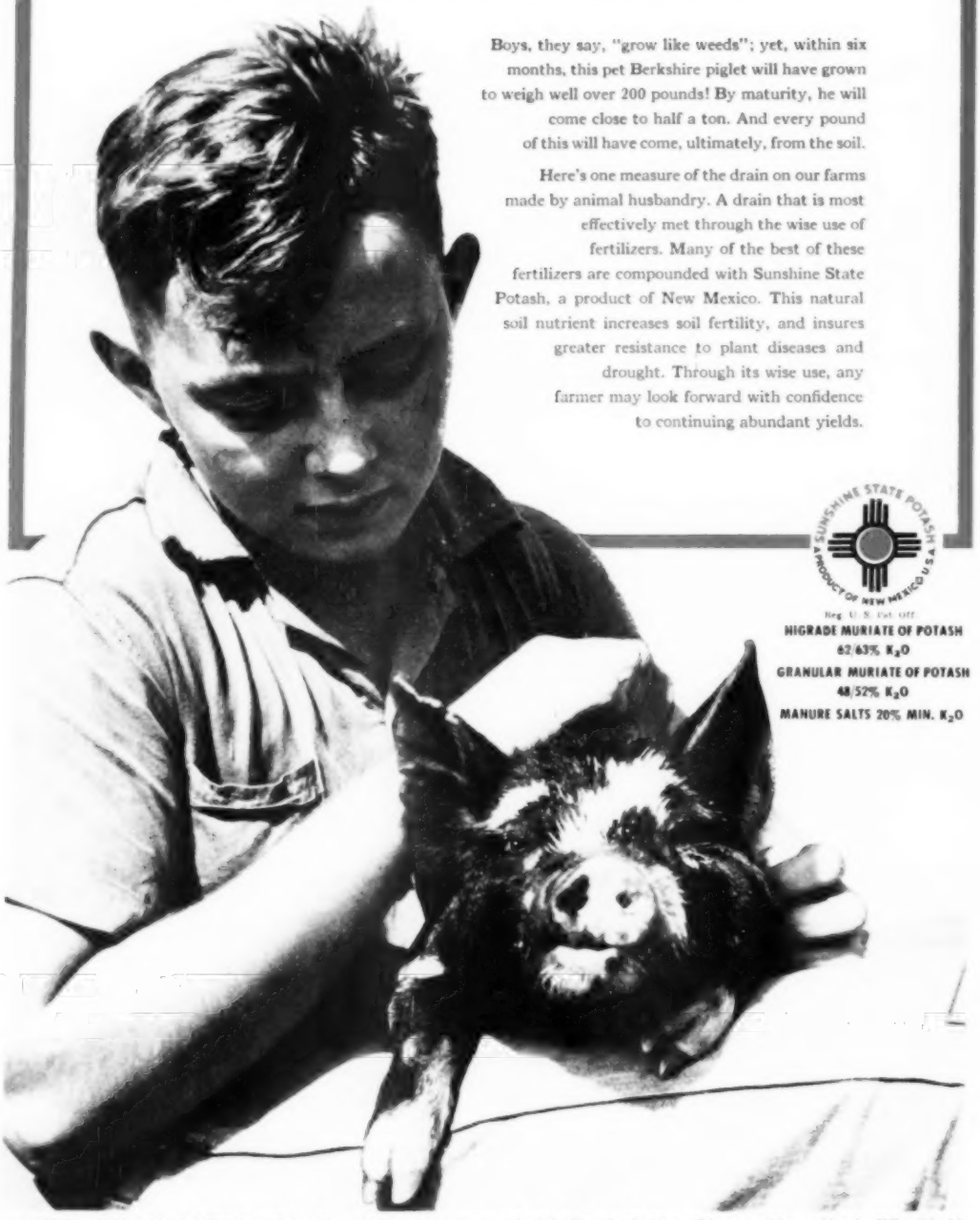
TYPICAL CELITE 400 PROPERTIES

Fineness: 8% maximum on 325 mesh
Density (Vibrated): 12.5 pounds per cubic foot
Bulk: Celite bulks much higher than most diluents
Absorption: 215% of its weight of water
300% of its weight of kerosene
pH Value: Below 7.0
Inertness: Compatible with insecticide and fungicide poisons
Suspension: Excellent in both air and water
Composition: Celite is amorphous diatomaceous silica (SiO_2)

*Reg. U. S. Pat. Off.

Johns-Manville CELITE 400

THE IMPORTANT BUSINESS OF GROWING UP



Boys, they say, "grow like weeds"; yet, within six months, this pet Berkshire piglet will have grown to weigh well over 200 pounds! By maturity, he will come close to half a ton. And every pound of this will have come, ultimately, from the soil.

Here's one measure of the drain on our farms made by animal husbandry. A drain that is most effectively met through the wise use of fertilizers. Many of the best of these fertilizers are compounded with Sunshine State Potash, a product of New Mexico. This natural soil nutrient increases soil fertility, and insures greater resistance to plant diseases and drought. Through its wise use, any farmer may look forward with confidence to continuing abundant yields.

SUNSHINE STATE POTASH
PRODUCT OF NEW MEXICO U.S.A.

Reg. U. S. Pat. Off.

HIGRADE MURIATE OF POTASH
62/63% K_2O
GRANULAR MURIATE OF POTASH
48/52% K_2O
MANURE SALTS 20% MIN. K_2O

UNITED STATES POTASH COMPANY, *Incorporated*, 30 Rockefeller Plaza, New York 20, N. Y.

BEMIS paper bags for chemicals

As one of America's largest producers of multiwalls and other paper bags, Bemis naturally makes many types to serve varied packaging requirements.

For the chemical industry, several types of construction are produced. The paper bags most generally used are shown here.

Note the variety of the Bemis line when you are buying paper bags for chemicals. It gives you wider choice in quality bags from a single source.

Bemis

Peoria, Ill. • East Pepperell, Mass. • Mobile, Ala. • Houston, Texas
San Francisco, Calif. • Vancouver, Wash. • Wilmington, Calif.

Baltimore • Boise • Boston • Brooklyn • Buffalo • Charlotte • Chicago • Cleveland • Denver
Detroit • Indianapolis • Jacksonville, Fla. • Kansas City • Los Angeles • Louisville • Memphis
Minneapolis • New Orleans • New York City • Norfolk • Oklahoma City • Omaha • Phoenix
Pittsburgh • St. Louis • Salina • Salt Lake City • Seattle • Wichita

$ZnSO_4 \cdot 1H_2O$

Zinc Sulphate

Top quality for Fertilizers and Orchard Sprays

The new plant of Maneely Chemical Company at Wheatland, Pa., is one of the most efficient and modernly equipped chemical plants in the country.

Vats and other equipment are glass or Monel lined to protect the purity of the products. A new, controlled process assures uniformly high quality.

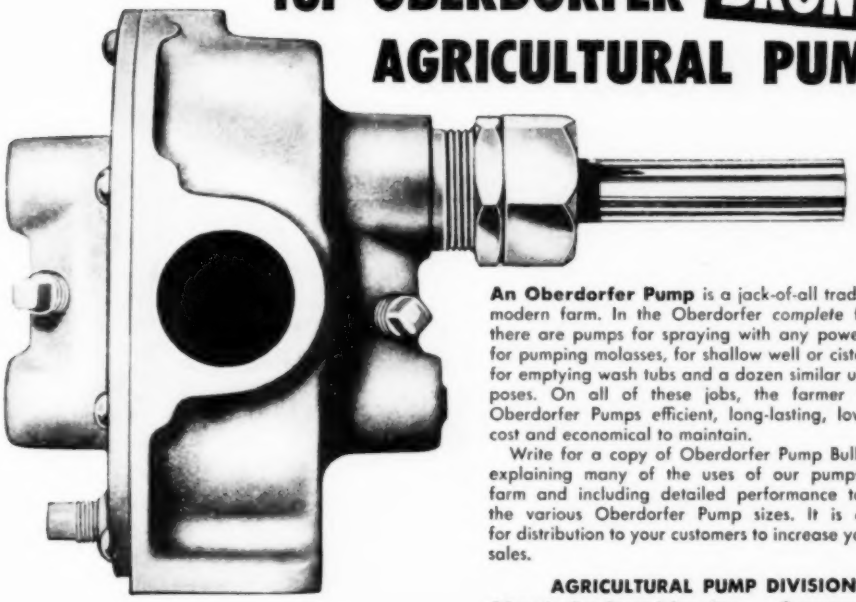
Maneely CHEMICAL COMPANY

Dept. A • 1300 Bankers Securities Bldg. • Philadelphia 7, Pa.

Plant, Wheatland, Pa.

DOZENS OF USES *on every farm...*

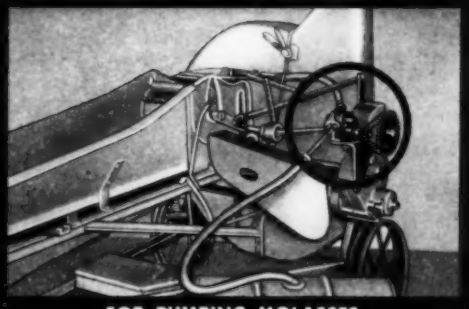
for OBERDORFER BRONZE AGRICULTURAL PUMPS



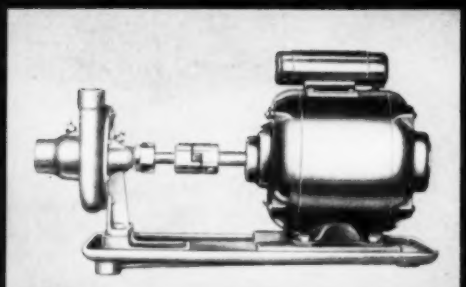
An Oberdorfer Pump is a jack-of-all trades on the modern farm. In the Oberdorfer *complete* farm line there are pumps for spraying with any power source, for pumping molasses, for shallow well or cistern work, for emptying wash tubs and a dozen similar utility purposes. On all of these jobs, the farmer will find Oberdorfer Pumps efficient, long-lasting, low in first cost and economical to maintain.

Write for a copy of Oberdorfer Pump Bulletin A-2, explaining many of the uses of our pumps on the farm and including detailed performance tables for the various Oberdorfer Pump sizes. It is available for distribution to your customers to increase your pump sales.

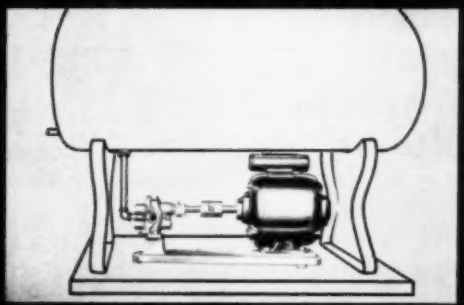
AGRICULTURAL PUMP DIVISION
Oberdorfer Foundries, Inc., Syracuse, N.Y.



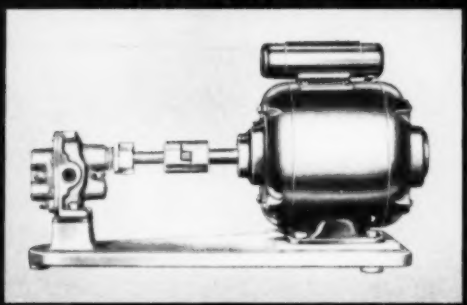
FOR PUMPING MOLASSES



FOR MULTI-USE CENTRIFUGAL INSTALLATIONS



FOR SHALLOW WELL or CISTERN PUMP



FOR ELECTRIC MOTOR DRIVE

Consistently *High* chemical and physical qualities . . .

BASIC CHEMICALS

FOR AGRICULTURE

to provide growers with maximum efficiency in spray & dust materials

DDT Technical (Ground and Flake), Dust Base, and Wettable Concentrates; Emulsifiable and Solvent Concentrates; Special Formulations.

BHC Technical, Dust Bases and Wettable Concentrates; Dust Mixtures.

PARATHION Dust Bases and Wettable Concentrates; Dust Mixtures.

NICOTINE Sulfate and Alkaloid.

ARSENATES—Lead, Calcium, Others.

PRE-HARVEST HORMONE Spray & Dust Materials.

WEED-KILLERS Trichloroacetates (Pre-Dormant); 2,4-D Acid, Amine, Sodium Salt (Pre-Harvest).

For your requirements, write or phone:

Insecticide Department

GENERAL CHEMICAL DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

Offices in Principal Agricultural Centers from Coast to Coast

TO PRODUCE HEAVY CHEMICALS AT A PROFIT!

CHEMICAL CONSTRUCTION CORPORATION

CONTRACTING CHEMICAL ENGINEERS

EMPIRE STATE BLDG., 350 FIFTH AVENUE, NEW YORK 1, N.Y.

EUROPEAN TECHNICAL REPRESENTATIVE CYANAMID PRODUCTS, LTD., BRETTENHAM HOUSE, LANCASTER PLACE, LONDON W.C.2, ENGLAND

EUROPEAN LICENSEE OF M.E.C. PROCESS HYDRO-NITRO S. A., 6 QUAI DU CHEVAL BLANC, GENEVA, SWITZERLAND

CABLES: CHEMICONST, NEW YORK

CHEMICO PLANTS ARE PROFITABLE INVESTMENTS

Adult codling moths

We all helped *CLIP* their wings

DDT
Technical grade — Emulsions
50% wettable powder — 50% dust base

BENZENE HEXACHLORIDE
Technical grade
Dust base — Wettable powder
GAM KIL—containing lindane
25% wettable powder
25% emulsion — 25% liquid concentrate

HEXAMITE
40% tetraethyl pyrophosphate

ARSENICALS
Lead Arsenate — Basic lead arsenate
Nu-Cal (neutral calcium arsenate)

SULPHUR
Dusting Sulphur — Commercial sulphur
Agricultural sulphur

ONCE the toughest of all apple insects to control, the codling moth is now much easier to check. DDT is doing the job better and is saving extra hundreds of thousands of bushels of apples annually. The codling moth is but one of many crop-destroying pests that, until recently, were difficult to control. A balanced use of the newer chemicals with the older, time-tested insecticides and fungicides is "clipping the wings" of crop pests today as never before.

For nearly half a century, Niagara chemists and entomologists have worked closely with state and federal agencies, and with other manufacturing chemists, to help develop and improve pest control chemicals and to promote their proper use. Now, with new and improved facilities for the production of basic agricultural chemicals, Niagara occupies a leading position in supplying these products to various channels of distribution for agricultural uses. You may be assured of high quality and uniformly dependable products when you buy Niagara.

WHEN YOU BUY Niagara YOU BUY PROTECTION

NIAGARA CHEMICAL DIVISION

FOOD MACHINERY AND CHEMICAL CORPORATION
Middleport, New York

Richmond, Calif. • Mt. Vernon, Wash. • New Orleans, La. • Greenville, Miss.
Jacksonville, Fla. • Tampa, Fla. • Pompano, Fla. • Harlingen, Tex.
Canadian Associate: NIAGARA BRAND SPRAY CO., LTD., Burlington, Ontario

fmc

"bye-bye brambles, briers and brush!"

say it with

MONSANTO

2,4,5-T

Formulators, when you need a herbicide formulation for the heavy job of clearing land of brambles, briers, brush or other woody plants that are too tough for 2,4-D, call on Monsanto 2,4,5-T. Monsanto 2,4,5-trichlorophenoxyacetic acid is suggested for the elimination of blackberry brambles, dewberries, gooseberries, raspberries, poison ivy and nuisance weeds on railroad, pipe-line, electric and telephone rights-of-way, range lands and hedgerows.

Monsanto 2,4,5-T acid, as well as 2,4,5-T isopropyl ester, is now available in quantity. The ester may be had in easy-to-handle lump form.

If brambles and brush are a problem with your customers, write for the Monsanto Progress Report: "2,4,5-T . . . A Herbicide for Brush and Woody Plants." Mail the coupon, contact the nearest Monsanto Sales Office or write: MONSANTO CHEMICAL COMPANY, Desk H, Organic Chemicals Division, 1766 South Second St., St. Louis 4, Missouri.

DISTRICT SALES OFFICES: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.

MONSANTO
CHEMICALS FOR PLASTICS

MONSANTO CHEMICAL COMPANY
Desk H, Organic Chemicals Division
1766 South Second Street, St. Louis 4, Missouri

Please send, without cost or obligation, items checked: _____ Progress Report on 2,4,5-T; _____ Technical Bulletin O-50, "2,4-D for Weed Control"; _____ Quotations on 2,4,5-T; _____ Quotations on 2,4-D.

Name _____ Title _____

Company _____

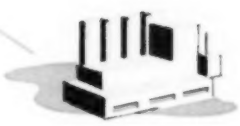
Street _____

City _____ Zone _____ State _____

SERVING INDUSTRY . . . WHICH SERVES MANKIND

OCTA-KLOR

Octa-Klor brand*
Chlordane



Basic toxicant for more effective control of Agricultural, Household and Industrial Insect pests, and Animal Ectoparasites.

Concentrates and ready-to-use insecticide formulations containing Agricultural or Refined grades Octa-Klor Brand Technical CHLORDANE are available from leading suppliers.

Write for information and technical data.

Julius Hyman & Company is proud to be serving so many members of the National Agricultural Chemical Association. It looks forward to a year of even greater service when Julius Hyman & Company's two important new insect toxicants, Octalene and Octalox, will be available for formulation of Agricultural Insecticides.
1) Julius Hyman & Co.'s trade name for Compound 118
2) Julius Hyman & Co.'s trade name for Compound 497
•T. M. Reg. U. S. Pat. Off.

Julius HYMAN & Co.
DENVER, COLORADO

EASTERN SALES OFFICE
11 WEST 42ND STREET
NEW YORK 18, NEW YORK

WEST COAST OFFICE
25 BEALE STREET
SAN FRANCISCO 5, CALIF.

THE EDITOR COMMENTS

THE possibility of an investigation of the toxicity of various pesticides and fertilizer material loomed late in August, following the introduction in Congress of a resolution on August 10, by Congressman Adolph Sabath, of Illinois. The resolution was almost identical with the one introduced earlier this year by Frank B. Keefe, which would appoint a seven-man committee to study the effects of using chemicals and compounds in food production.

Since Congressman Sabath is prominent in the House and holds the position of Chairman of the House Rules Committee (where the Keefe resolution has laid dormant for some time) there appeared to be a strong possibility that Mr. Sabath's resolution may receive action by the House before Congress adjourns. In this event, the way may be cleared for an investigation by the committee during the recess.

As we have mentioned before in these columns, it would seem more productive of results if the funds allocated for such an investigation were used in an all-out educational program. More knowledge is needed all down the line: manufacturers, processors, sales organizations, custom applicators, and the grower himself all stand in need of more information. The industry has gone a long way to alleviate the general situation through the issuance of numerous bulletins and pamphlets, and the labels on many of the products tell a great deal to the user who takes the trouble to read. But there is still a long way to go before the purchaser of 2,4-D, for instance, will become as wise in its use and limitations as he should be for the protection of his own crops and those of his neighbors.

POSSIBLY by the time this issue of *Agricultural Chemicals* reaches its subscribers, a successor to George F. Leonard will have been named as president of the National Agricultural Chemicals Association. We feel that a few words of commendation are in order in view of the job Mr. Leonard has done. During the three years that "Grub" has held office, the trade has had to make many postwar adjustments. It has gone through a period of shortages, then apparent over-production on certain items, and currently, an almost unprecedented shortage of manufactured goods due to unusual demands. Aside from that, it has had to contend with inaccurate newspaper stories and magazine articles about pesticides. These the Association has taken in stride.

The pressure on members of an association is severe under these conditions, and of course, those at the top spend many a wakeful hour to figure out solutions to the problems at hand. We think that "Grub" Leonard and his staff have done a first rate job in the face of some pretty tough problems. As he is being succeeded after his three year term, the new president will inherit a good-sized mantle of responsibility. And "Grub" will no doubt be the first to offer his successor the benefit of his years of experience in the top position!

UNLESS a greater effort is made to protect and save our productive farm lands, civilization faces a "tragic decline", according to Hugh H. Bennett, chief of the U. S. Soil Conservation Service, who made that statement before a recent United Nations Scientific Conference. He reported that only 4,000,000,000 acres of arable land are left in the entire world, and not all of this land is good.

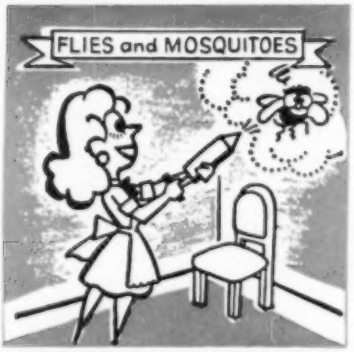
The scientific application of modern soil conservation methods was pointed out as being the "only real promise of adequate production in the future".

In this regard, it is encouraging to note the increasing use of commercial fertilizer materials in areas where the soil is still good, before the natural nutrition is dissipated. Growers are becoming more and more soil conscious, with the result, that they are regarding the purchase of fertilizers as a most important adjunct to the production of crops.

Fertilizer alone, of course, does not mean soil conservation, but it does indicate a desire on the part of the farmer to take care of his soil, and an interest in keeping it fertile for his own and future generations.

This Month Let's Talk About

CHLORDANE



For PCO's:

Penicklor (Chlordane) 20% Oil Solution

Penicklor (Chlordane) 46% Emulsifiable

Penicklor (Chlordane) 73½% Emulsifiable

Penicklor (Chlordane) 50% Emulsifiable—Stable

For Manufacturers of Household Sprays:

Penicklor (Chlordane) 20% Oil Solution

Penicklor (Chlordane) 33% Emulsifiable—Stable and Transparent

Penicklor (Chlordane) 50% Emulsifiable—Stable

For Agricultural Application:

Penicklor (Chlordane) 46% Emulsifiable—CONTAINS 4 POUNDS TECHNICAL CHLORDANE PER GALLON

Penicklor (Chlordane) 73½% Emulsifiable—CONTAINS 8 POUNDS TECHNICAL CHLORDANE PER GALLON

Penicklor (Chlordane) 50% Wettable Powder

Penicklor emulsifiable concentrates are packed in SPECIAL LINED DRUMS to prevent loss of effectiveness.

Write for details on special properties of various formulations

The World's Largest Botanical Drug House

S. B. PENICK & COMPANY

50 CHURCH STREET, NEW YORK 7, N. Y.
Telephone COrtlandt 7-1970

735 WEST DIVISION STREET, CHICAGO 10, ILL.
Telephone MOhawk 4-5651

BOTANICAL DRUGS • MEDICINAL CHEMICALS • ESSENTIAL OILS • AROMATIC CHEMICALS

Problems involved in AIRPLANE SPRAYING

by

Kenneth Messenger

U. S. Department of Agriculture
Bureau of Entomology and Plant Quarantine

TREMENDOUS strides have been taken in the development of aircraft for agricultural spraying and dusting since the first aerial dusting was tried out in 1918. At that time, George G. Schweis crawled out on the wing of an old biplane near Reno, Nevada, and as the frail craft rocked uncertainly, Mr. Schweis released a sack of dust over a field of alfalfa.

Progress in aerial dusting developed slowly until the beginning of World War II. At that time, a number of events occurred to bring into focus the need for airplane application of insecticides. In the first place, the United States army was faced with the problem of wiping out disease-carrying mosquitoes which were threatening the health of thousands of soldiers. Since it had sufficient funds to carry out any reasonable experiment and had a top priority on DDT, the army was able to work out a satisfactory program of airplane spraying. The cooperation of other Federal agencies was sought, and the skill of specialists of these organizations was utilized in constructing and testing many different types of aircraft equipment for this purpose. Although much of it was not particularly adapted to civil needs, this work was an important contribution toward the development of aircraft spraying and dusting.

One of the earliest efforts to release liquids from aircraft was the spraying of dust as it was being discharged so that it would adhere more readily to plant surfaces. Numerous devices were constructed for this purpose, but none was particularly successful. Some of the liquids used were very viscous or full of suspended solids. The spray nozzles clogged, and it was almost impossible to secure even coverage. Rotating brushes and discs, impelled by wind-driven propellers, were devised to overcome these faults. With the development of liquids containing DDT, many new devices were designed. One of the first was a series of spray nozzles attached to a boom at the rear end of a rectangular venturi suspended below the fuselage. This system was a combination of the equipment used for spreading dust and that needed for spraying liquids—a

Army C-47 discharging exhaust-generated aerosol in Florida, 1945. (Note lack of downward thrust . . . spray is composed of exceedingly small drops.)

transitional device. The shortcomings of this type of installation are apparent now, but the arrangement was reasonably effective and served an important purpose at the time as a step in the development of spray equipment.

Since the war a number of factors have combined to create interest in this field. These include an abundance of low-priced aircraft, many trained pilots, high farm income, and new highly effective insecticides. Some of the liquids in use are so formulated that with a planeload of liquid, a considerably larger acreage can be sprayed than can be dusted with a planeload of dust. This advantage is enhanced further by the liquids being deposited more fully and permanently. The question therefore arises, "To what extent will liquid insecticides eventually displace dust insecticides?"

Recent examples of aircraft spraying serve as testimony of its effectiveness, and help to answer the question. Approximately 215,000 acres in Illinois were sprayed for the control of grasshoppers in 1948. More than 400,000 acres in Idaho were sprayed for the control of tussock moths in 1947. The Bureau of Entomology and Plant Quarantine, U. S. D. A., in cooperation with several States in the Northeast, has sprayed large acreages of forest lands for the control of gypsy moth. On this work, for which aircraft is particularly effective, one planeload of insecticide (in a DC-3 aircraft) sprayed an acreage equivalent to that formerly sprayed by one ground unit in 4½ years! Scores of similar instances indicate the progress of this method of pest control, in which several concentrated insecticides in the form of solutions, emulsions, and suspensions have been used with excellent results at greatly reduced cost.

It is extremely difficult, to make accurate comparisons between sprays and dusts. Better comparisons will be possible, however, when machinery for discharging liquids from aircraft is better understood and more easily calibrated, and when some of the important principles are better understood. The size of particles in dust can be determined readily, is moderately uniform, and usually remains constant. The approximate area treated can be evaluated visually. In sprays, however, there are factors such as drop size, evaporation rate, and drift which are not readily measured. Furthermore, these factors may vary greatly when sprays are applied with different devices.

DC-3 spraying toxaphene for grasshopper control in southeastern Montana, August, 1948. (Photo by D. C. Hall.) This type of plane can carry heavy loads of insecticidal material, enabling greater coverage of area without refilling.

At least three physical requisites are basic for insecticides to be released from aircraft for the control of agricultural insects: (1) The material must fall to the crop and reach the insects within a reasonable and measurable distance from the point of release, (2) its physical characteristics must assure satisfactory coverage of plant surfaces through use of wind or convection air currents, and (3) the insecticide must adhere firmly to the plant surfaces. The first requisite is satisfied more fully by liquids than by dusts. The second is usually better satisfied by dusts than by liquids. This difference can be minimized by breaking up the liquid into smaller (lighter) drops. Actually the difference is not so great as it appears to be, for dust particles are more easily seen than are small spray drops. The third requisite is more fully achieved by liquids than by dusts, especially when solutions or emulsions are used.

Much has been said and written about formulations of sprays and devices used for their dispersal from aircraft. Much is known also about the insects, weeds, and other pests which require control. There is another factor in aircraft spraying about which less has been said and, in fact, about which much less is known. That is the behavior of spray drops after they leave the aircraft.

Behavior of Droplets

WHEN liquids are sprayed from most ground machines, the pressure placed upon the liquid acts to drive and direct it toward the target. In some machines a stream of air is used to project the liquid to the target. In aircraft spraying, the most significant forces involved in conveying sprays to the crop are usually gravity, wind, and convection air currents. These forces are not always helpful. The force of gravity may pull the larger drops down to the earth between plants being treated, the wind may carry smaller drops away, and convection currents may cause smaller drops to rise rather than fall. Nevertheless, effective work can be done with materials applied in liquid form from aircraft; substantially increased effectiveness may be obtained when the factors governing spray behavior are understood and properly evaluated.

What happens to liquids upon release from ground machines and from aircraft? When released from the former, the distance the spray will be projected is determined principally by the pressure exerted upon it and the amount of liquid released. Its direction of travel can also be governed fairly well. In machines such as mist blowers, the distance and direction the spray will move is determined largely by the amount, velocity, and direction of the air that carries it. When released from aircraft, however, the spray soon finds itself floating in mid-air, its movement subject only to the forces of nature. The action of the air on the liquid at the point of discharge is much the same in both mist blowers and aircraft. In mist blowers the air is moving; in airplanes the machine is moving. But all similarity in the behavior of the liquid ends almost immediately after it leaves the nozzles.

The size of spray drops is customarily given in terms of their diameter, measured in microns. One micron is 1 1000 of a millimeter. Sixteen 100-micron drops, placed in a row, equal 1 16 inch.

While the importance of obtaining certain drop sizes from ground equipment is by no means insignificant, in sprays released from aircraft, it is of prime importance. The reason for this difference is that in aircraft spraying, the problem of directing the spray from the airplane to the crop or pest being treated is usually far more difficult. Consider the behavior of different-sized drops of liquid after they have been released from aircraft. The recognition of the true size relationship of drops is paramount. Their volumes and surface areas determine largely their direction of travel when they are left to the forces of gravity, wind, and convection air currents. Their volumes, rather than their diameters, also indicate their relative toxicity. Mathematically, their surface areas vary directly with the squares of their diameters, and their volumes as the cubes of their diameters. This means that a 100-micron drop is not 3 times as large as a 33-micron drop; it is 27 times as large! A 500-micron drop is not 100 times the size of a 5-micron drop, but a *million* times as large!

These true relationships are used to determine the velocity at which drops of various sizes will fall, and hence the distance they will drift when acted upon by wind. It takes a 5-micron drop (of water) approximately 1 hour to fall a distance of 10 feet in still air, a 500-micron drop only 2 seconds.[1] A 100-micron drop, the size recommended for many types of aircraft spraying, requires 11 seconds to fall 10 feet. It will drift a distance of 48 feet during that period in a 3-mile-per-hour wind. Recommendations are frequently made for drops as small as 33 microns in diameter.

[1] Time for drops of various sizes to fall 10 feet is from an article by F. A. Brooks, published in Agricultural Engineering, June 1947.

Below: Stearman biplane spraying for control of tussock moth in State of Idaho in June, 1947. (This photo through courtesy of P. C. Johnson.)

Yet drops of this size released in a 3-mile-per-hour wind from rest at a height of 10 feet will drift approximately 400 feet before reaching the ground.[2] If a gallon of liquid could be broken up uniformly into drops of 33-micron size and deposited over an acre of ground, there would be 32,000 drops on each square inch of surface. The deposit per square inch from a gallon of liquid reduced to drops 5 microns in diameter is 9,200,000! And these drops would drift more than 3 miles while falling 10 feet in a 3-mph wind.

These theoretical examples serve to indicate the importance of obtaining drops within a size range that can be controlled. However, too much emphasis can be placed on the drift of the smaller drops. The very small drops may represent a small percentage of the total volume of material when sprays are discharged from most types of aircraft mechanisms. If they drift or evaporate, efficiency may not be seriously reduced.

A number of factors influence the size of drops deposited on a crop when released from various aircraft-spraying devices. Some are interrelated and some difficult of appraisal. A general concept of these factors is required, however, in the planning of satisfactory machinery. Among the factors are (1) viscosity and temperature of the liquid, (2) density of the liquid, (3) evaporation rate of the liquid, (4) pressure applied on the liquid, (5) discharge rate of the liquid, (6) altitude of aircraft, (7) speed of the aircraft, (8) type of nozzle or orifice through which the liquid is discharged, and (9) position of the nozzle or orifice in relation to the aircraft and its direction of travel.

Three ranges of drop size are commonly needed in aircraft spraying. Very small, slow-descending, space-filling drops are used for controlling insects in space. Drops large enough to have residual value but still small and numerous enough to cover plant surfaces are more useful for controlling sedentary insects and plant diseases. Mobile insects are controlled adequately with still larger drops, since a long residual effect rather than complete coverage is the important consideration. Weeds are controlled and cotton is defoliated satisfactorily with these larger, more easily-controlled drops.

Even when the most effective drop size for any particular problem can be determined, a considerable range in size is still inevitable. And it is obviously impossible to produce spray drops of such a size that they will fall quickly to the crop, and yet circulate or swirl about the leaves and stems of the plants being treated. These physical limitations need not be seriously restrictive, however. Under some conditions, where cross winds may be utilized, a wide range in drop size may even serve to advantage in obtaining an effective deposit over a wide swath.

The advantages that aircraft spraying has over aircraft dusting are significant justification for additional research. Aircraft may fly higher, and therefore larger, faster aircraft may be used; wider swaths with more uniform coverage can be obtained; satisfactory applications can be made under windier conditions so that more hours of flying are possible; the separation of toxic materials from diluents is negligible; spray residue on plants is more enduring, less likely to be dislodged by rain and wind so that fewer applications per season are usually required. Another advantage of spraying over dusting is that liquid can be conducted outward from the fuselage to convenient and effective points of discharge, the design of equipment being thus facilitated.

Great reliance is sometimes placed on the capability of aircraft to push the air downward to the ground and thus assure the rapid descent of the spray and prevent excessive drift. Obviously there is a downward force exerted on the air immediately below the wings of an airplane. However, the speed of most aircraft is such that this force acts on the air at any given point for an extremely short period of time. This action may impart some downward velocity to the spray drops, but it is the actual downward movement of air under the aircraft that is the useful factor in obtaining effective spray deposits. In fixed-wing aircraft, this downward movement of air is normally small. Some operators who have increased the power of their aircraft are able to vary their angle of attack appreci-

(*Turn to page 76*)

[2] No allowance is made here for the downward thrust imparted by aircraft. That is covered in a later paragraph.

An L-4 plane equipped with "transitional" combination venturi and spray boom. Photo taken at Orlando, Florida in 1943.

Protection of growing plants from soil insects by use of

Insecticides on Seeds

by

G. S. Hensill

California Spray-Chemical Corp.

TREATING seeds before planting, to prevent seed and seedling damage by soil insects, is a recent development in the use of insecticides. Tests of this nature have been carried out during the past two years with the pure gamma isomer of hexachlorocyclohexane, so that field usage on a commercial basis is now on a rather large scale. To date, the commercial work has been concentrated principally on wireworm control, but indications are that control of several other soil insects may be obtained also.

For several years, seed treatment with fungicides has been a commercial practice. The use of an insecticide in seed treatment is the newest development and so far bids well to becoming an important item in soil insect control, seed and seedling protection. Work is also developing along the line of insecticide and fungicide combinations for seed treatment.

Only since the development of organic insecticides in the past few years, and the production of the pure gamma isomer of hexachlorocyclohexane, has the seed treatment process for insect control become a possibility. This material has been found to be effective in small amounts and in the pure form does not leave residual odors or impart flavors to crops from treated seed. Residual life of the insecticide is long enough to protect the seed and seedling from insect damage and insure the planting a damage-free start in growth, together with a substantial control of the soil insects.

During 1948, bean seeds for the planting of 11,000 to 15,000 acres in one of the large valleys of California were treated with one-half ounce of pure gamma isomer of hexachlorocyclohexane to each 100 pounds of bean seed. The results of this treatment were excellent and treated areas produced heavier stands and better crops. (Fig. 1). A greatly increased treatment of bean seed in this area and other areas was made during the 1949 season.

The chief method of treatment to date has been with a wettable powder formulation containing twenty five percent by weight of pure gamma isomer of hexachlorocyclohexane. This material at the rate of 2 to 3 ounces per 100 pounds of seed has been dusted in dry form at time of planting seed. A sufficient amount of material adheres to the seed in this method without the use of water. In addition, a special wettable powder formulation for seed treating, containing 75 percent pure gamma isomer of hexachlorocyclohexane, is now on the market. This product is particularly adaptable for use with fungicides in slurry seed treater equipment.

Other seed, in addition to bean seed, have been treated and with equally good results. Large amounts of sugar beet seed, in addition to corn, peas, wheat and barley are

A number of insecticides are adaptable to treating seeds for control of soil pests. Method does not affect wireworms deep in the soil but kills nearly all which contact the treated seeds

now being treated commercially with the insecticide.

In addition to the present commercial uses, tests in field and laboratory are being conducted on seeds of other plants. Based on this work, the treatment of melon, squash and cucumber seed is to be recommended. Data on various other seeds is also being obtained.

One of the interesting questions in connection with the use of "Isotox"* for seed treatment is: does it control the wireworms, or does it merely protect the seeds? The University of California has made counts on wireworms covering this point and estimates that 55% to 75% of the larger wireworms come up to the treated seed which acts as a bait and are killed. In some instances, the control may run as high as 90% of the wireworms coming up to the seed and being killed. The treatment does not affect wireworms that are deep down in the soil and which stay down until later in the season, probably after the crop is harvested. They do not injure crops such as sugar beets, beans and the like, since they are down so deep. When the worms come up later, their feeding does not reduce crop size materially. It also indicates that seed treatment will be necessary each year with the insecticide in order to maintain the wireworm control.

As a typical count result on Lima beans where only the seeds were treated and the mature plants were checked, it was found that but 7% of the mature plants had wireworm borings in the plants. As a contrast, the untreated checks had damaged seeds and the crop of beans was scattered throughout the field due to serious damage to the seed and immature plants. In addition, some 40% of the mature Lima bean plants showed borings in the stems by wireworms later in the season.

Seed may be treated by dry dusting the seed in a tub, barrel or suitable container. Dusts containing from one to 5 or 10 percent pure gamma isomer of hexachlorocyclohexane may be used. Most experience to date has been with a wettable powder formulation containing 25 percent pure gamma isomer of hexachlorocyclohexane. Preferably, the seed should be treated a few days prior to planting.

Treatment of seed may also be done with a slurry treater. The wettable powder formulation containing 75 percent pure gamma isomer of hexachlorocyclohexane is especially adaptable to this equipment for combination use with a fungicide in the minimum of water. The 25 percent pure gamma isomer wettable powder is also adaptable to this method. These wettable powders may be combined with the various commercial seed treating fungicides where combination treatment is desirable. The amounts of insecticide to use on seed are shown in the table at the bottom of the page.

One of the most important benefits from the use of pure gamma isomer for seed treatment is that the grower can reduce the poundage of seed per acre by perhaps 30% to 50% and without reduction in either size or uniformity in the crop. Lowering of the cost of seed per acre is more than sufficient to pay for the relatively insignificant cost of insecticide seed treatment. The grower also gains on the necessity for replanting where wireworms and certain other pest damage is excessive. This is another real dollar saving to the grower. The biggest saving to the grower however, is that there does appear to be a practical control of wireworms due to their feeding on the treated seed which acts as a poison bait, which low level treatment has no effect on the crop. As an example, mercury is commonly used on such crops as a seed protectant with no consideration for the mercury as a residual crop poison. Based on thousands of acres of practical use, the value of seed treatment for insect control is indeed promising.

SEED	*OUNCES PURE GAMMA ISOMER TO USE PER 100 POUNDS SEED*		
	Pure Gamma *Isomer*	25% Gamma *Formulation*	75% Gamma *Formulation*
Beans (except large limas)	1	4	$1\frac{1}{3}$
Large Lima Beans	$\frac{1}{2}$	2	$\frac{2}{3}$
Peas	1	4	$1\frac{1}{3}$
Barley	1	4	$1\frac{1}{3}$
Cucumbers	2	8	$2\frac{2}{3}$
Tomatoes	4	16	$5\frac{1}{3}$
Corn	2	8	$2\frac{2}{3}$
Sugar Beets	4	16	$5\frac{1}{3}$
Milo	1	4	$1\frac{2}{3}$

Data on other seeds of various other crops will be available soon.

* Trade Mark product by California Spray Chemical Corp.

Tabulation of 1948-49 & 1949-50 Fertilizer Supplies of

Nitrogen Phosphate & Potash

T. O. Porter
The Assistant Administrator for Production
Production and Marketing Administration
U. S. Department of Agriculture
Washington, D. C.

THE 1948–49 fiscal year established another record with respect to fertilizers for U.S. agriculture. In the light of currently available production data,[1] and specific information voluntarily supplied by industry members, the 1948–49 supply of plant foods comprised about 1,010,000 tons of nitrogen (N); 1,910,000 tons of available phosphoric acid (P_2O_5); and 1,025,000 tons of potash (K_2O). The combined total of 3,945,000 tons exceeds 1947–48 reported consumption of plant food by some 300,000 tons.

Nitrogen (N)

THE 1948–49 fertilizer nitrogen supply for the United States and possessions is estimated to have been derived as follows:

Source	Tons Nitrogen
Synthetic ammonia produced at commercially operated plants	605,000
Ammonia compounds and liquors produced from by-product ammonia	175,000
Synthetic ammonia produced at plants operated by or for the Army	58,000
Natural organic sources	30,000
Net commercial imports	142,000
Total	1,010,000

Various components of the synthetic nitrogen industry and importers of nitrogenous fertilizer materials have cooperated in supplying special information on U. S. deliveries during the 1948–49 year.[2] On the basis of such information and available data on production at by-product plants, it has been possible to classify the 1948–49 fertilizer supply by type and source of material.

Approximately 68 percent of the 1948–49 nitrogen supply was in solid and 32 percent in liquid forms. Of the former, approximately 70 percent represented domestic production and 30 percent imported. Except for a small quantity received from Norway the 1948–49 imports were roughly of one-half Chilean and one-half Canadian origin.

Commercial exports of nitrogenous fertilizer during 1948–49 were approximately 62,000 tons of nitrogen. By law, the Army was required to furnish one-half of these exports, and also to provide 10 percent of its output of anhydrous ammonia to the domestic civilian economy.

Commercial imports and exports of nitrogenous fertilizer in 1948–49 were established under agreements

[1] Sources of data: Bureau of the Census, Office of Domestic Commerce, Office of International Trade, Department of Commerce; Bureau of Mines, Department of the Interior; The American Potash Institute; The National Fertilizer Association; and reports of nitrogen industry components and importers of nitrogenous materials to Production and Marketing Administration, Department of Agriculture.

Note: Throughout this statement all quantities are expressed in tons of 2,000 pounds and are calculated on the basis of N-P-K content of finished product.

[2] Includes production of TVA plant at Muscle Shoals.

[3] These reports and the cooperation shown by such respondents are gratefully acknowledged.

reached within the International Emergency Food Committee. The fertilizer allocation functions of this committee became inoperative as of June 30, 1949. Exporting countries accordingly are no longer subject to IEFC limitations with respect to quantities supplied to the United States. In view of the continued necessity to assure adequate supplies of nitrogen for U. S. farmers, commercial exports from this country in 1949-50 have been placed under a tentative quota of not exceeding 52,000 tons of nitrogen on a strictly voluntary basis.

In the United States, a rather sizable increase has taken place in the capacity of private concerns to produce synthetic ammonia. In addition, the production capacity of some 120,000 tons of synthetic ammonia at Army-owned facilities is expected to be available for civilian use during 1949–50.

The 1949–50 production of by-product ammonia compounds is not likely to exceed 1948–49 output and perhaps will be somewhat less. On the other hand, there is ample synthetic ammonium sulfate converting capacity available to process such quantities of anhydrous ammonia as may be economically feasible to utilize for such purpose.

TABLE I

U. S. Fertilizer Nitrogen Supply for 1948–49

Type and Source	*Tons Nitrogen*
Ammonium Nitrate 32.5% N and over	
Domestic	127,000
Imported	41,000
Total	168,000
Ammonium Sulfate 20.5% N	
Domestic, by-product	171,000
Domestic, synthetic	60,000
Imported	16,000
Total	247,000
Nitrogen Compounds, Other	
Domestic sodium nitrate, ammonium phosphate, ammonium nitrate-lime, urea mixtures	93,000
Imported calcium cyanamid, ammonium phosphate, calcium nitrate	41,000
Total	134,000
Sodium Nitrate	
Imported	106,000
Natural Organics	
Domestic and imported	30,000
Total Solid Nitrogen	685,000
Ammoniating Liquors	
Nitrogen solutions, ammonium nitrate-ammonia and urea ammonia compounds	240,000
Ammonia for ammoniation, anhydrous and aqua	30,000
Total	270,000
Ammonia for Direct Application	
Anhydrous and aqua and ammonium nitrate water	55,000
Total Liquid Nitrogen	325,000
GRAND TOTAL	1,010,000

An estimate made earlier in 1949 indicated that at least 120,000 tons of additional nitrogen might be in prospect for U.S. farmers during the 1949-50 season as compared with the then estimated 1948–49 supply. Since that time, several developments including decisions with respect to the Army and the Economic Cooperation Administration export programs and the action taken regarding the release of a substantial part of the Cactus Ordnance Work's ammonia output, have tended to move the potential 1949–50 increase upward.

On the basis of an analysis of available domestic plant capacity and assuming net commercial imports of at least previous levels, the 1949–50 supply of fertilizer nitrogen could easily exceed the million tons plus for 1948–1949 by some 200–250 thousand tons. Achievement of this increase depends upon several factors, including the general level of national economy and farmer purchasing power. Another important feature is that maintenance of high levels of production at many plants requires orderly and regular movement to trade outlets. This situation is especially significant in connection with nitrogen solutions and other liquid forms of nitrogenous materials.

Phosphates (P_2O_5)

DURING 1948–49, according to reports to the Bureau of the Census from 182 plants, production of normal superphosphate and wet base goods totaled 1,638,000 tons available phosphoric acid (P_2O_5) content and concentrated superphosphate approximately 224,000 tons P_2O_5 basis.

Stocks of normal superphosphate on hand as of July 1, 1948, were reported at approximately 215,000 tons P_2O_5 basis, and on June 30, 1949, at 137,000 tons, a net decrease during the period of 78,000 tons. Stocks of concentrated superphosphate increased approximately 13,000 tons P_2O_5 basis from about 22,000 tons on July 1, 1948, to 35,000 tons on June 30, 1949. Stocks

TABLE 2

U. S. Phosphate Fertilizer Supplies for 1948–49

Type and Source	Tons Available Phosphoric Acid P_2O_5
U. S. Production	
Normal superphosphate	1,627,000
Concentrated superphosphate	224,000
Wet base goods	11,000
Other[a]	143,000
Total	2,005,000
Imports	
Nitrogenous phosphatic material	16,000
Mixed fertilizers and other sources	9,000
Total	25,000
Total Supply	2,030,000
Exports	
Normal superphosphate	94,000
Concentrated superphosphate	11,000
Nitrogenous phosphatic and mixed fertilizers	15,000
Total	120,000
NET Supply U. S. and Possessions	1,910,000

[a] Includes an estimated 78,000 tons available phosphoric acid (P_2O_5) contained in defluorinated phosphate, basic slag, by-product phosphate, meta phosphate and ground phosphate rock and total phosphoric acid content of organic materials used for fertilizer, and approximately 65,000 tons available acid (1949) represented by inventory change during the year.

of wet base goods were not significantly different on the respective dates. It appears that some 55,000 tons of P_2O_5 from stocks on hand July 1, 1949, were moved into the trade during the year.

The 1948–49 phosphate fertilizer supply by type and source of material is set out in table 2, presented at the top of this page.

The year 1948–49 saw installation or completion of equipment for large-scale increased capacity to mine and prepare phosphate rock and to manufacture processed phosphates, including concentrated superphosphates.

Supplies of phosphate fertilizer (available phosphoric acid basis) for domestic use during 1949–50 could readily exceed the indicated 1948–49 supply by 10 to 15 percent. There is sufficient capacity for domestic mining and processing of 2,200,000 tons of available phosphoric acid (P_2O_5) or more for domestic use.

Potash (K_2O)

DURING the prewar years (1935–39) U. S. farmers were using an average of 375,000 tons of potash (K_2O content) each year. Approximately one-half of this quantity was represented by imported material. For 1948–49 the potash supply for fertilizer purposes in the United States and possessions was substantially as follows:

U. S. Production for Fertilizer Purposes	Tons K_2O
Soluble potash salts	1,040,000
Organic and by-product source	20,000[a]
Total	1,060,000
Imports	22,000
Total Supply	1,082,000
Exports	57,000
NET Supply	1,025,000

The 1948–49 potash supply is classified as to type of material in (Table 3).

Exports of potash from the United States are confined chiefly to western Hemisphere countries. During 1948–49 exports to Canada amounted to approximately 40,000 tons K_2O; to Cuba, 4,300 tons; to other Latin American countries, 12,300 tons; and to the Philippines, 400 tons. Imports during the past year were nominal, totaling about 22,000 tons K_2O.

Supplies of potash for U. S. farmers during 1949–50, based upon projected production rates of domestic sources and assuming imports and exports at recent levels, are estimated at some 1,150,000 tons K_2O. This figure could be exceeded provided a substantial import movement developed.

[a] Includes potash content of oil-seed meals, cotton hull ash, and by-product residues utilized for fertilizer.

TABLE 3

U. S. Fertilizer Potash Supply for 1948–49

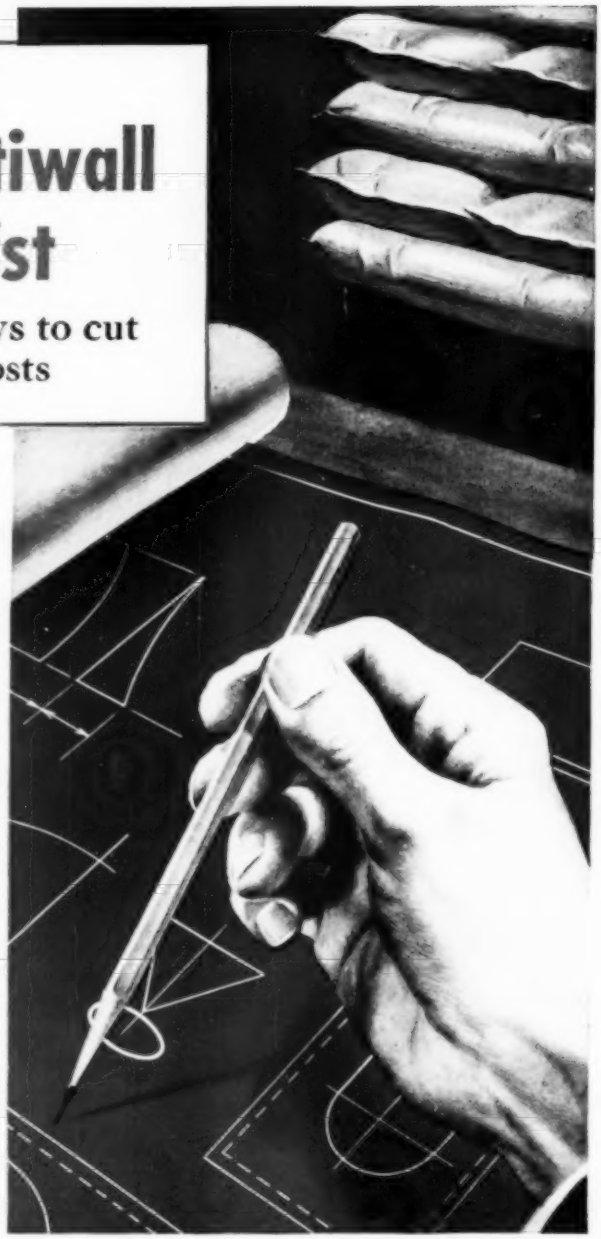
Type of Material	Tons K_2O
Muriate of potash 60%	790,000
Muriate of potash 50%	72,000
Sulfate of potash and sulfate of potash magnesia	80,000
Manure salts	63,000
Organic and by-product sources	20,000[a]
Total	1,025,000

[a] Includes potash content of oil-seed meals, cotton hull ash, and by-product residues utilized for fertilizer.

Your

Union Multiwall Specialist

Knows many ways to cut packaging costs



HOW LONG has it been since an *expert* analyzed your packaging methods?

Recent improvements in packaging methods and materials now make Union Multiwall Bags the preferred packaging for many different commodities . . . over 300 in all. They speed up packaging, cut labor and shipping costs, guard against contamination.

Even if you're now using multiwall bags, the Union Multiwall representative who calls on you can give you new ideas that may save you money. For he is backed by the specialized packaging knowledge of America's largest maker of paper bags—with its own forests, the largest completely integrated Kraft pulp-to-bag plant in the world, and skilled engineers and designers.

Let him show you how Union resources and packaging experience can help you!

Multiple Protection

Opens Easily

Prevents Siftage

Empties Clean

UNION Multiwall Bags

UNION BAG & PAPER CORPORATION

233 BROADWAY, NEW YORK 7, NEW YORK

Offices in: CHICAGO, ILL. • MINNEAPOLIS, MINN. • KANSAS CITY, MO. • HOUSTON, TEXAS

TRADE MARK UNION

Resume of 1949 Season and a view of the current Insecticide Situation

by

Melvin Goldberg
Pesticide Advisory Service
New York City

NO season within the past four to six years has seen the volume of insecticides bought and sold to equal that of the current season. In terms of both production and sales, the record of 1949 is likely to surpass any within this decade. And as might be expected, by far the greatest volume was brought about because of almost unprecedented infestations of cotton insects in the south, corn borers in the midwest, and grasshoppers in various other parts of the country.

The demand for cotton insecticides was particularly heavy and as this is written early in August, many of the formulating plants are in heavy operation, the output being limited only by the availability of raw materials. In addition to the use of benzene hexachloride combinations, toxaphene materials and chlordane formulations, considerable quantities of calcium arsenate were also being used. Parathion in combination with toxaphene and calcium arsenate was also being employed to some extent.

Despite the stepped-up production of toxaphene, however, the unexpected demand depleted stocks and there simply was not enough to go around. And of course, the demand for this material in other directions was heavy also.

Production of benzene hexachloride did fall off somewhat during March and April but picked up considerably in May, June and July when the probability of a heavy infestation became apparent. The industry had a considerable stockpile of technical benzene hexachloride at the beginning of the season; however, movement of technical was slow during early spring and thus there was some curtailment in production.

Chlordane, which is finding increasing use in the control of cotton insects, was in somewhat short supply due to demand in other directions. The new compounds, "119" and "497," showed considerable promise in large-scale field trials for the control of most cotton insects, but these were available only in small quantities.

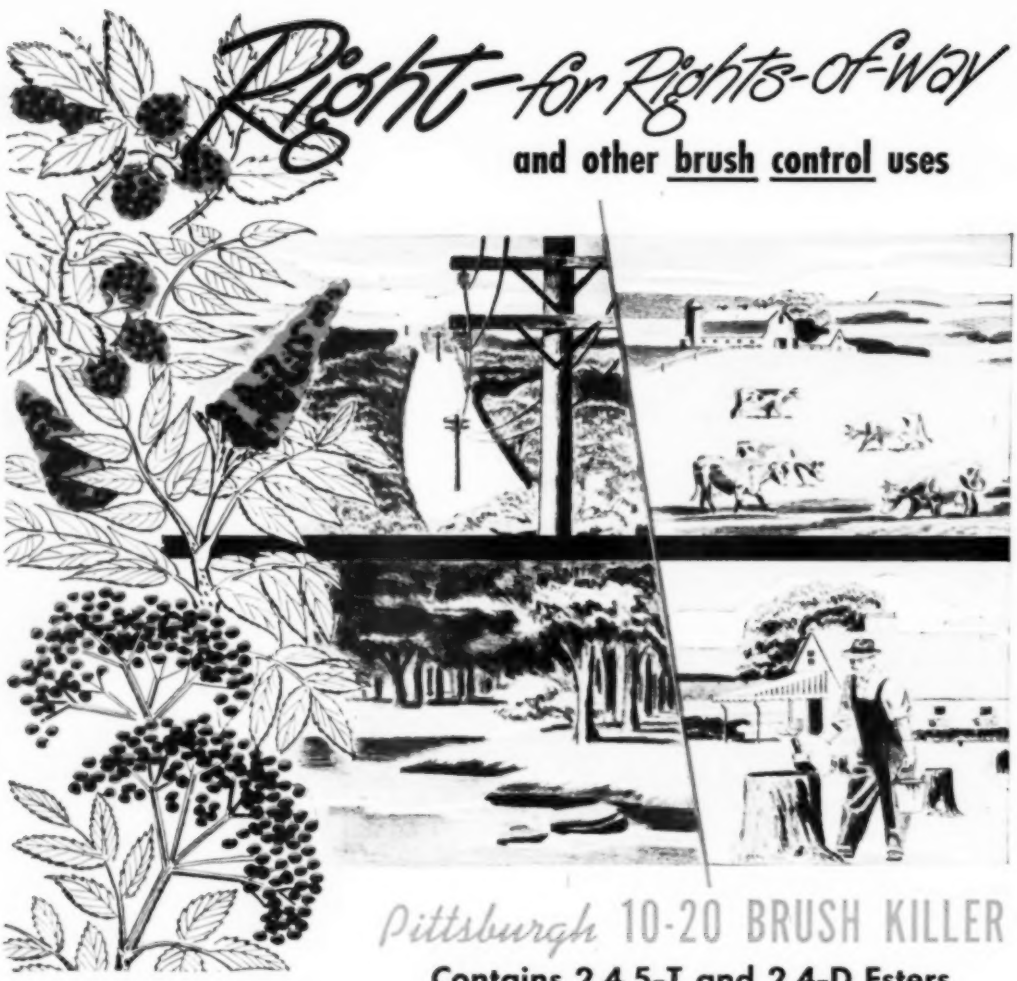
The insecticide industry has been the target of much unwarranted criticism during the recent season, because when the need for these materials became urgent, severe shortages hampered deliveries. Such complaints have come from farmers, dealers and distributors alike. However, in defense of the manufacturer, it should be remembered that the farmer in particular, has been urged for many years to anticipate his requirements early and place orders so that the manufacturer may have some fairly definite idea of what production schedules he will have to maintain to meet the demand. Because these urgings have gone unheeded for the most part, situations occur such as characterized this season. It must be admitted that very little progress has been made in the direction of educating the farmer along this line. This is particularly true in the cotton area, where insecticide sales from year to year are either a "feast or a famine."

It behooves the farmer and his suppliers to take in some part of their requirements as insurance in anticipation of the infestation, but it is also imperative that the industry (in cooperation with government agencies) continue the educational job. Adequate statistics and other information are available which should form the basis for renewed efforts in this direction. However, it must be emphasized again that in the final analysis, the industry must carry the burden just as it always has in the past, until the educational program can begin to bear fruit.

An indication of the seriousness of the infestation can be gleaned

Right—for Rights-of-Way

and other brush control uses



Pittsburgh 10-20 BRUSH KILLER

Contains 2,4,5-T and 2,4-D Esters

10-20 Brush Killer effective on these plants:

Blackberry
Elderberry
Sumac
Osage Orange
Willow Alder
Buck Brush
Wild Cherry
Hawthorn
Black Locust
Poison Ivy
Cherokee Rose
Sage Brush
and many other woody plants

Nothing is more savory than a juicy blackberry pie or the strong, sweet flavor of elderberry jelly—but the woody growth of these and other plants such as sumac, alder and osage orange can make a "jungle" out of public utility rights-of-way, grazing lands, farms and creek banks unless constantly controlled.

Pittsburgh 10-20 Brush Killer, a hormone type herbicide, containing 2,4,5-T and 2,4-D Esters, has proved much more effective than 2,4-D alone for control of such heavy underbrush and gives a permanent kill with one application when properly used. It may also be painted on fresh-cut stumps of poplar, willow and other persistent trees to prevent re-growth. Combined with *Pittsburgh* Phenolate-O, 10-20 Brush Killer may also be used as a general weed killer.

Pittsburgh 10-20 Brush Killer is the answer to your brush-control problems. Full technical information about this effective chemical, and advice concerning its use, is available for the asking!

WRITE FOR TECHNICAL BULLETIN 302

PITTSBURGH AGRICULTURAL CHEMICAL CO.
6505-A Empire State Building • 350 Fifth Ave. • New York 1, N.Y.
Affiliated with
PITTSBURGH COKE & CHEMICAL COMPANY
Grant Building • Pittsburgh 19, Pa.

from the following information given out by the USDA in early August. Aside from severe boll weevil infestations in many parts of the southeast, this year's cotton production outlook would have been much greater. As it is, the crop estimate is 63,000 bales, or 0.4% less than last year's, in spite of an increase in acreage. It is estimated that 25,580,000 acres of cotton were planted in 1949 and the yield is estimated to be 14,805,000 bales.

Industry spokesmen have expressed their appreciation for the work done by the U. S. Department of Agriculture, its extension services and the work of the state services in getting word out to the industry concerning the progress of insect infestations. This type of information has proved helpful in the planning of production schedules and sales.

Interest continues in the possibility of synthetic pyrethrum-like material being available soon. While it is difficult at the present time to evaluate when the material will be ready for market and at what price, it is generally conceded by industry spokesmen that the process as developed by the U.S.D.A. chemists is commercially practicable both from an efficiency and economy point of view. Many industry representatives believe that there are several steps which must be taken before the answers are available on this problem.

1) Determination of the toxicity of the pyrethrum-like materials that have already been produced.

2) Availability of raw materials which must be used in the production of these esters.

3) Determination of what volume will be required, so that some ideas as to plant construction costs may be determined.

It is felt that none of these problems can be solved until there is some field work done to determine which derivative should be made and in what amount. Without this information, the answer to the above steps cannot be obtained, of course. At least 36 to 60 months will probably be required to obtain some of these answers and there is apparently very little likelihood of accelerating this time factor. As near as it can be determined, there are about 15 separate and distinct steps necessary in the synthesis of the pyrethrum-like esters. These may be cut down to some extent if certain of the raw materials can be made available as a regular supply. Otherwise, the manufacturer of Cinerin-I will have to make his own. It is pointed out that these steps are for the most part hazardous due to the type of materials used and to the use of low boiling inflammable solvents, so that it may be necessary that when such plants are erected they will have to be in locations other than presently available facilities or special expensive installations will have to be constructed to minimize these hazards.

So far as requirements of synthetic material are concerned, it is of interest that in terms of actual pyrethrins, the greatest quantity of material ever used in the U. S. has been about 130,000 lbs. It is true that the availability of a synthetic substitute at a sufficiently good price might bring about an increase in uses which were not considered economically feasible when normally-priced natural pyrethrins were available. This, however, remains to be determined.

DDT Output Gains

PRODUCTION of technical DDT continues to increase. First quarter production in 1949 was 9,979,151 lbs. as compared with 1948 first quarter production of 6,558,322 lbs. Latest figures available indicate that production in April of this year was 3,063,663 lbs. while March was 3,568,457 lbs. February production was 3,060,978 lbs. It is assumed by most industry spokesmen contacted that production for May, June and July was at about the same level as the April production or even higher. During June and most of July, technical DDT was in very tight supply and much of the available material was moving at premium prices.

March exports of technical DDT totaled 3,745,000 lbs. while January exports were 647,000 lbs. and February exports were 743,000 lbs. The first quarter total exports were 5,135,000 lbs. with material going to the following destinations: Greece 1,743,000 lbs.; Brazil 948,000 lbs.; Ceylon 504,000 lbs.; Belgium 305,000 lbs.

Benzene Hexachloride Status

DURING April 1949, 1,223,111 pounds of BHC were produced in terms of technical material. March production was 1,414,070 lbs. However, most industry spokesmen pointed out that the urgent requirements for BHC began to appear in the latter part of May and June, and it is expected that the May, June and July production will be of a much higher order than the figures shown for April and March.

With the apparent shortage of toxaphene, BHC and chlordane for use in cotton insect control, attention was focused on the position of calcium arsenate. However, calcium arsenate production was rather low and it is doubtful that there was much increase in production during May and June in view of the normal problems of raw material purchases and shipments in order to meet demands in the field. March production of calcium arsenate was only 729,000 lbs. while April production was 1,159,000 lbs.

The Department of Agriculture announced during July their approval of lindane—pure gamma isomer of benzene hexachloride—for use as a residual spray for fly control in dairy barns. It was pointed out in their press release that lindane is not recommended for use on dairy cattle for insect control nor should it be used on forage that is to be fed to dairy cattle or animals being finished for slaughter.

(Continued on page 82)

Annual Fall Meeting of the National Agricultural

Panel of experts appear in forum; international aspect of meeting seen in presence of Dr. Galley of London . . . Dr. Rohwer again on program for the U.S.D.A. . . . Food and Drug Administration represented by T. B. Bellis . . . Association reviews past year and plans for future . . . election of officers scheduled . . . Hitchner, Leonard offer report and annual address, respectively . . . Dr. Simmons reports on insecticides and public health . . . Townsend on program as chief, Industrial Hygiene Div., Public Health Service.

THE first annual meeting under its new name was scheduled for September 7, 8 and 9 by the National Agricultural Chemicals Association. The meeting was to be held at the Essex and Sussex, Spring Lake, N. J. Since this convention is an annual meeting, the Association was to elect new officers, which includes the naming of a president and members to the board of directors. The nominating committee was to submit to the assembly the nominees for various offices.

On the tentative program released some time before the meeting was to open, N.A.C. Association president, George F. Leonard, executive vice-president of Tobacco By-Products & Chemical Corp., Richmond, Va. was to make his annual address. Lea S. Hitchner, executive secretary and treasurer of

Lea S. Hitchner

T. B. Bellis

George F. Leonard

Spring Lake, New Jersey
September 7, 8 and 9, 1949

Chemicals Association

the Association, Washington, D. C., was to present his annual report to the group, and the chairmen of a number of committees were to report on their activities of the past year.

Dr. R. J. Wilson, American Medical Association, was to talk on the toxicity of various economic poisons as related to the medical profession; followed by an address by T. B. Bellis, representative of the Food and Drug Administration of the Federal Security Agency, Washington.

Long a featured speaker on the programs of the National Agricultural Chemicals Association, Dr. S. A. Rohwer will talk. Dr. Rohwer, assistant chief, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, Washington, had not announced his subject at press time, preferring to discuss topics of particular interest at the time of the meeting.

To have an official view of the U. S. Public Health Service toward insecticides, fungicides and weed killers, Dr. J. G. Townsend, chief of the Division of Industrial Hygiene, U. S. Public Health Service, Washington, was to address the N.A.C. group. The title of his talk was not available at press time.

An international aspect is brought in with a talk by Dr. R. A. E. Galley, secretary of the British Agricultural Research Council, London, England. Dr. Galley also had not announced the subject of his remarks.

The story of how new toxicants are being developed was to be related by Dr. Samuel W. Simmons, in charge of the Technical Development Division of the U. S. Public Health Service, Savannah, Ga. The subject of Dr. Simmons' address is "A Resumé of Recent Developments of Insecticides and Rodenticides at the U. S. Public Health Service Laboratories at Savannah."

An industry forum made up of men prominent in the manufacture of insecticides, fungicides and weed killers, was scheduled to appear as a feature of the program. Names of members of the panel were not available at press time, but it had been learned that Dr. Robert A. Kehoe, director of the Kettering Laboratories of Applied Physiology, University of Cincinnati, would be moderator of the forum.

Arrangements were being made for the entertainment of ladies present, and for the usual golf tournament for men. Henry Wood, Tobacco By-Products & Chemical Corp., Richmond, Va., is chairman of the golf committee.

S. W. Simmons

R. A. E. Galley

J. G. Townsend

Response of several economically important plants to Sodium Salt of

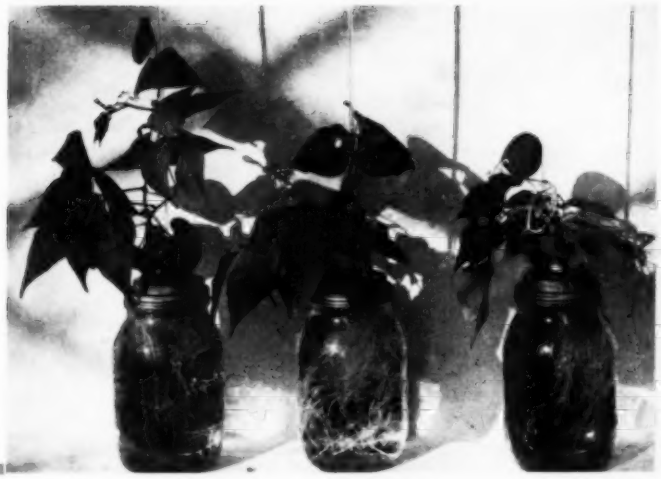
2,4-D

NOTWITHSTANDING the success achieved by the use of 2,4-D materials in the destruction of weed pests, certain disadvantages have resulted also from widespread application of this hormone. Considering that some 18 million pounds of this chemical were purchased during the past year for weed control, it is not surprising that a number of occasions have arisen where the material has had injurious effects on certain economic crops. Such complaints have resulted from a number of causes. In one instance, for example, the dusting of 2,4-D on rice in the summer of 1947 caused injury to some 2,000 acres of cotton plants in the Gulf Coast area of Texas (3). On other occasions, vapors given off from equipment which had contained 0.1% ethyl 2,4-D were held responsible for damage to tomato, cabbage, zinnia, petunia, and tobacco plants (9). Reports have indicated that sprays carried away by air currents resulted in injury to grapevines (5), pin and red oaks (12), cotton (14), smooth and sweet gum, ailanthus, pear and sumac (8), also rose, huckleberry, mulberry, locust, and other plants. (9). Such damage in the field has not been uncommon, and most workers are familiar with the characteristic distortion produced by over-stimulation in certain parts of the plant.

However, not as much emphasis has been put on the potential injurious effect of trace amounts of 2,4-D which may find their way into the soil with the exception of studies conducted by Taylor and others at Camp Dietrick, Md. (4, 10, 15, 16, 17, 19, 20). In order to gain additional information on this problem, experimental plants were grown in sand and water culture and treated with minute amounts of the Na (sodium) salt of 2,4-D. The immediate objectives were threefold. First, tests were made to determine the response of a given species to an incorporation of 2,4-D in the nutrient substrate. Then, a study

Left, control plant; right, corn plant grown in solution culture for 10 days with 4 ppm. 2,4-D. Reduction in size, wilting of leaves, and root discoloration resulted.

by
Ida A. Leone and Eileen Brennan
Rutgers University
New Brunswick, N. J.



Left, normal bean plant; center, plant which had received 0.1 cc. of 4 ppm. 2,4-D solution; right, plant which had received 4 ppm. 2,4-D in nutrient solution. (Photographed 6 days after 2 day treatment.)

was made of the concentration of 2,4-D in the substrate necessary to produce the response; and third, the difference in response in a given plant to 2,4-D applied through the root or to aerial portions was checked. The experimental plants included a group of vegetable crops, tomato (*Lycopersicum esculentum*, Rutgers), bean (*Phaseolus vulgaris*, Bountiful bush), and corn (*Zea mays*, U. S. hybrid #13); a group of flowering plants,—nasturtium (*Tropaelum phaseolus*, single dwarf), geranium (*Pelargonium* sp., Olympic Red), and poinsettia (*Euphorbia pulcherrima*, Albert Ecke); and buckwheat (*Polygonum fagopyrum*, Japanese).

Cultural Method

PLANTS were grown in either solution or sand culture according to the method of Shive and Robbins (13). In the solution culture method, 1 gallon glass vessels were used with 2 plants per jar and one jar per treatment. Solutions were renewed daily. In the case of the root-treated plants, after termination of 2,4-D applications, the roots were thoroughly washed with distilled water and the jars decontaminated before re-using. Two gallon glazed crocks filled with white quartz sand were used for the sand cultures. Nutrient solutions were applied by the drip method at the rate of 2 liters per day. Again in the case of root-treated plants, when 2,4-D treatment was terminated, the sand was thoroughly flushed with distilled water before continuing the application of the basic nutrient solution.

Two methods of application of the Na salt of 2,4-D were used, some of each species being treated through the roots and some through the aerial portions. After the desired period of exposure, plants were transferred to nutrient solutions free of the hormone and subsequent growth was compared with that of untreated plants. In treating plants through the roots, 2,4-D was incorporated into the basic nutrient solution at levels ranging from 0 to 4 ppm.

Although an attempt was made to keep conditions as uniform as possible for all species, certain variations in procedure were necessary according to the nature and number of plants available. Since it was desirable to have plants of a suitable size for the best exhibition of growth responses, the age of all species at the start of treatment was not kept constant. The presentation time depended upon the length of time necessary to show well defined growth responses, therefore differing with species. The specific procedure for each plant species is presented in Table 1.

Results and Discussion

ALTHOUGH this experimentation was of a general nature, it serves to illustrate the wide variety of responses which may be elicited by plants of different species when exposed to minute amounts of 2,4-D. Hamner and Tukey (7) have already pointed out the great diversity of responses which may be produced by weeds following the application of 2,4-D in herbicidal quantities up to 1000 ppm. Although no concentrations were used in excess of 4 ppm in this study, yet abnormalities in plant growth ranged from temporary distortion of plant parts, to death of the plant. Responses varied with plant species and with amount and method of application.

The most common and probably the most easily recognized effect of 2,4-D compounds is epinastic curvature of the leaves and stems as cited by Avery et al. (1). This phenomenon was observed within the range of 1 to 4 ppm 2,4-D in all

the species treated with the exception of corn, nasturtium, and buckwheat. The degree of curvature usually varied with the concentration of the hormone applied. This was particularly true when 2,4-D was supplied through the roots, the plant at the highest concentration (4 ppm) always showing the greatest amount of distortion.

All the species so affected showed the growth effects within a relatively short time. The length of time required at the 4 ppm level was 1 day for tomato and poinsettia, 2 days for bean, and 4 days for geranium. As the concentration of 2,4-D was decreased, a longer period of time was required for the responses to occur, until at 1 ppm 2,4-D, tomato required 13 days, bean 5, and poinsettia 3; while the geranium at 1 ppm showed no symptoms. A slightly longer time was required for the exhibition of similar responses as a result of painting the shoot apex with 2,4-D, the cultures requiring from 4 to 6 days at 4 ppm and at 1 ppm, from 4 to 8 days.

Application of 2,4-D produced variations both in color and texture of leaves, depending upon the plant treated. Many of the plants showed leaf chlorosis regardless of whether or not epinasty was present. When the plants were treated through the root, the leaves of bean, geranium, nasturtium, and even corn in sand culture became chlorotic as did the leaves of bean and corn plants which were painted with 2,4-D. In contrast, leaves of tomato which were painted became abnormally dark green. In addition to chlorosis, bean leaves displayed a unique brown pigmentation along the veins which was especially apparent on the leaves which had been painted.

TABLE I

Plant	Age of plant treated	Cultural method	2,4-D method application	2,4-D treatment levels	2,4-D presentation time
Tomato	6 weeks	Solution	Root-Shoot	0, 1, 2, 3, 4 ppm	20 days
Bean	3	Solution	Root-Shoot	0, .5, 1, 2, 3, 4	2
Corn	5	Solution	Root-Shoot	0, 1, 2, 3, 4	10
Corn	7	Sand	Root	0, 1, 2, 3	14
Poinsettia	2	Sand	Root-Shoot	0, 1, 2, 3, 4	1
Geranium	3	Sand	Root-Shoot	0, 1, 2, 3, 4	1
Nasturtium	7	Sand	Root	0, .5, 1, 2, 3, 4	21
Buckwheat	8	Sand	Root	0, 1, 2, 3	21

Buckwheat leaves also showed a color effect at the highest concentration (3 ppm) which in this case consisted of bronzing or reddening of the entire leaf. Departure from normal leaf texture was observed in that painted tomato, bean, and geranium leaves exhibited a peculiar stiffness or crispness. Possibly a mobilization of carbohydrates to the area of application caused such a change in texture. Even when plants appeared in a state of collapse and near death from root applications of the hormone, as in the case of geranium and nasturtium, the foliage felt surprisingly rigid. Application of 2,4-D also had a variable effect on leaf size of the treated plants. Bean plants painted with 1 ppm had a much greater leaf area than either the controls or plants supplied with higher concentrations of 2,4-D. Such stimulative effects were not observed in any of the other species. At the other extreme, 2,4-D was responsible for a decrease in leaf size of tomato and nasturtium leaves. Both modes of treatment caused a diminution in size with increasing applications of the hormone; however, they remained normal in form.

Stem effects, in addition to the characteristic curvature already noted, included a condition peculiar to treated tomato plants. Root primordia were initiated along the main stem of the plants, imparting a roughened or blotchy appearance particularly at the highest concen-

Poinsettia plant grown in sand culture with a nutrient solution containing 4 ppm. 2,4-D showing typical distortion after 1 day of treatment.

Left, control geranium plant; right, geranium grown in sand culture with nutrient solution containing 4 ppm. 2,4-D for 1 day. (Photographed 5 days later.)

tration (4 ppm) of 2,4-D. Root primordia have been previously observed by Hamner and Tukey (7) on stems of tomato and by Swanson (15) on kidney beans exposed to lethal doses of 2,4-D. However, they were not produced by any species other than tomato in this test. In addition, tomato showed a downward bending of the lateral branches. Bean stems were shortened, colorless, and thickened at the nodes as a result of 2,4-D root treatment.

Effects on Roots

ROOT effects proved to be extremely interesting. Although in no case was any root response produced by the painting method of application, a peculiar hypertrophy or fasciation of the lateral roots as well as curvature and distortion often resulted in plants treated through the roots. There appeared to be an optimum concentration at which this stimulative effect to portions of the root occurred. Perhaps, the most striking example of root hypertrophy was encountered in the 2 ppm bean plant. Immediately after a 2-day treatment, these scale-like thickenings appeared on the lateral roots; 7 days later, flat strap-like projections averaging 1 cm. wide arose from the region of the hypocotyl. By the time of harvest, some new roots appeared which were normal. Corn roots of plants which had been treated with 2 and 3 ppm 2,4-D through the roots in sand culture exhibited a similar hypertrophy of the root hairs, again most severe at the 2 ppm concentration.

In the nasturtium series, the root of the 0.5 ppm plant bore scaly protuberances which were not present on the roots of the 1, 2, 3, or 4 ppm plants. Since these latter roots were small and darkened, it seems probable that such concentrations exceeded the range which caused stimulation and tended to have a killing effect. This explanation also applies in the case of buckwheat where pebble-like growths which were abundant on the 1 ppm plant, occured to a lesser degree on the 2 and 3 ppm roots which were considerably darkened.

Other examples of root fasciation were observed by Taylor (16) on soybean, kidney bean, and cowpeas grown in culture solutions containing from 0.16 to 0.60 ppm 2,4-D. Notwithstanding the fact that in this present study proliferations were not formed on roots of plants in which only the aerial parts had been painted with the hormone, it is interesting to note that Capinpin and Oefemia (2) observed such "nodule-like" growths on the main roots of *Mimosa* and *Amaranthus* when the tops of the plants had been sprayed with 1000 ppm 2,4-D. Results of this study suggest the possibility that small amounts of the chemical entered the soil and were actually absorbed through the roots of the plant.

In addition to the characteristic effects reported on leaf, stem, and root tissue, 2,4-D treatment was also reflected in reproductive tissue. In 1947 Thurlow and Bonner (18) stated that, since a marked decrease in the auxin content of plants occurred at the time of flowering, it might be possible to delay flowering by supplying the plants externally with auxin. On spraying soybean and Xanthium grown under short photoperiods with 500 ppm of indole acetic acid and naphthalene acetic acid, they found that the production of flower primordia was inhibited. Likewise, Green and Fowler (6) having immersed roots of petunias and soybeans in 200 ppm of indole-3-acetic acid for 24 hours prior to flowering, found a delay of 23 and 12 days respectively in the appearance of flower buds. In this experiment, 2,4-D in small concentrations produced similar results. Treated poinsettias produced blossoms 12 to 44 days later than control plants according to the 2,4-D concentration applied. When they did appear, however, the blooms were normal in color and position. Geraniums painted with 2,4-D reacted similarly, flowering being delayed but normal in appearance. In the case of root-treated geraniums the 3 and 4 ppm plants were killed prior to flowering and were therefore not observed, but the

(*Turn to page 82*)

For Basic Agricultural Chemicals

KOLKER

DDT

100% Technical grade
50% Wettable dust
25% Emulsifiable solutions
30% Emulsifiable solutions
40% Emulsifiable solutions

2,4-D

Acid
Sodium salt
Triethanolamine salt
Methyl ester
Butyl ester
Isopropyl ester
40% Butyl ester solution
44% Isopropyl ester solution

Kolker Chemical Works Inc.
80 LISTER AVENUE • NEWARK 5, N. J.
Manufacturers of Organic Chemicals

The Listening Post

The Insect Situation During the Last Half of July

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Haeussler is in charge of Insect Pest Survey and Information, Agric. Research Adm., B. E. & P. Q., U.S.D.A. His observations are based on latest reports from collaborators in the department's country-wide pest surveys.

By G. J. Haeussler

WEATHER conditions in general, during the last half of July were favorable for the development of cotton plants, but also of the boll weevil. In most localities, cotton squared so rapidly that many bolls developed despite heavy weevil infestation. Reports indicated that insecticides have been used more extensively for boll weevil control this year than at any previous time.

Bollworm infestations were reported from Texas, Oklahoma, Arkansas, Alabama, Louisiana, Arizona, and South Carolina. Damage in general has been light, except in northwestern Louisiana, where a critical bollworm situation developed toward the end of July.

The second cotton leafworm of the season was found on July 25 in Refugio County, Texas. Infestations of the cotton leafhopper have remained generally low.

The European corn borer infestation has been unusually heavy this year over practically the entire infested area, with the possible exception of New York. The emergence of second generation moths was well under way by the first of August in many mid-western areas. General treatment of canning corn for control of second generation borers was under way in Illinois by that time. All indications pointed toward an unusually heavy infestation in late corn and canners and seed producers were advised to be prepared to treat late fields if necessary. In Wisconsin, most field corn was sufficiently mature by early August to escape serious damage from second generation borers. Damage to field corn in New Jersey was moderate, and the most severe stalk damage observed on sweet corn was about 17 percent, with ear damage of about 6 percent from first generation borers. An increasing number of New York State growers have been dusting market sweet corn and most were satisfied with the results.

Most canneries on the Eastern shore of Maryland received the first sweet corn during the last week of July. This early corn showed more damage from the corn earworm than from the European corn borer. Extensive earworm damage to sweet corn was reported from New Jersey at that same time. The first and second broods of earworms overlapped there and infestations are expected to continue heavy for the remainder of the season. Moderate to severe earworm infestations in sweet corn were also reported during July from New York, South Carolina, Wisconsin, Missouri, and the southeastern States.

Sap beetles were one of the major pests of sweet corn this year in New Jersey. Fields have been observed with as many as half the ears containing larvae. Both treated and untreated fields suffered extensive damage.

Reports as of the end of July indicated that the velvet bean caterpillar was showing up in parts of Georgia and South Carolina. According to these reports the infestation may be light this year and too late in the season to cause much trouble.

Grasshoppers Serious

THE grasshopper situation continued serious in many areas, while in others infestations were less troublesome during the last half of July. Infestations were widely scattered in south-central Arizona, but heavy populations were noticed in only a few localities. Hoppers were locally troublesome in some northeastern, northwestern, and southwestern areas of that state. In California, infestations were rapidly diminishing in intensity, although some control work was still in progress in each county where grasshoppers were a major problem earlier in the season.

Second-crop alfalfa fields in areas of north-central Minnesota carried populations of from 10–50 hoppers per square yard. Infestations in Missouri were of a local nature and confined generally to marginal, fence row and ditch-bank vegetation or orchard cover crops, with populations numbering up to 10 per square yard. In southwestern Oklahoma grasshopper control was tapering off, although damage was still occurring in some late cotton, forage, and seed alfalfa fields. Infestations had become scattered in many areas of Baker, Wheeler, and Grant Counties of Oregon, and farmers in the latter county had ceased baiting before the end of July.

In South Dakota control operations, with both organics and bait, were continuing in the western part of the state. Damage to small grains and alfalfa was confined to leaf injury and there had been little damage to the corn crop by July 23. In the south-central part of the state, grasshoppers were beginning to move at that time from fields into roadside and marginal vegetation preparatory to laying eggs. Control with bait and organic insecticides was reported to have been satisfactory throughout most of

PRENTOX PEST-TESTED

BASIC INSECTICIDE CONCENTRATES

DDT
Wettable and Dry Powders
Oil Concentrates
Emulsifiable Concentrates

ROTENONE
Derris and Cube
Powdered Concentrates

TOXAPHENE
Wettable Powders
Dust Concentrates
Emulsifiable Concentrates

SABADILLA
Ground Seed
Dust Concentrates

CHLORDANE
Oil Concentrates
Wettable and Dry Powders
Emulsifiable Concentrates

RED SQUILL
Fortified Powder
Fortified Liquid

BHC
Wettable Powders
Dust Concentrates

PYRETHRUM
Powder
No. 20 Extract

R. J. PRENTISS & CO., Inc.

110 WILLIAM STREET, NEW YORK 7, N. Y. 9 S. CLINTON STREET, CHICAGO 6, ILL.

that area. Severe damage to grain, corn, and alfalfa crops was reported from some parts of east-central South Dakota where grasshoppers were moving into such crops as other vegetation dried due to lack of moisture.

Baiting continued to decline throughout western Texas, and very little control was being attempted in the east-central areas of that State. Spotted, but rather serious grasshopper infestations were requiring control during the last half of July in some areas of Utah. Baiting was increasing throughout west-central Wisconsin where scattered infestations of one species, in some instances numbering 100 per square yard, occurred in alfalfa and marginal vegetation.

In Daniels County of northeastern Montana, farmer interest in grasshopper control was at high pitch during the last half of July. Damage was widespread and mounting, with some farmers losing from 50 to 60 acres of wheat per day. Grasshoppers were also causing heavy losses to wheat fields in adjoining Roosevelt and Sheridan Counties. Reports indicated that toxaphene and chlordane sprays were giving excellent control. By July 31, the state, county, federal agencies, and individuals cooperating in the grasshopper control program in range areas of Montana-Wyoming, had baited and rebaited a total of 2,900,000 acres. Most areas in which initial kills had not been up to expectations showed a steady reduction in grasshopper numbers and showed satisfactory percentages of kill by a week to 10 days after the bait was applied.

Federal and State agencies were obliged to discontinue spreading grasshopper bait in the Montana-Wyoming range areas by the end of July. Available funds were sufficient only to continue providing bait at mixing stations for a limited time. Arrangements were made for county agents to issue the bait on request and it became necessary for ranchers to take over hauling and spreading it at their own expense. A limited number of bait spreaders were left in the area to supplement the ranchers' own equipment. All airplanes under contract to the government were released and became available for hire by ranchers desiring to use such facilities for continuing control operations at their own expense.

The codling moth infestation continued light in all areas, although a noticeable increase in larval injury was observed in southern New Jersey toward the end of July. In Missouri, the infestation was said to be the lowest in years. Infestations of the red-banded leaf roller continue to be reported from orchard sections of most states, although in general,

(*Turn to page 81*)

Apple Scab Control by ERADICANT FUNGICIDES

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

M. C. Goldsworthy, J. C. Dunegan, and R. A. Wilson, of the Bureau of Plant Industry, Soils, and Agricultural Engineering, report tests indicating that under suitable condition, eradicant sprays applied in two steps may help considerably in simplifying the control of apple scab (caused by the fungus *Venturia inaequalis*).

Other workers had demonstrated previously that spraying the ground under the trees with the sodium salt of dinitro ortho cresol before the buds opened in the spring eliminates more than 90 percent of the leaf infection originating from the overwintering spore stage, or ascospores, in the fallen leaves from last season. Also, certain organic mercury compounds sprayed on the trees had been found to be very effective in eradicating leaf and fruit infection during the early growing season. However, neither method used alone eliminated enough potential inoculum to make the regular spray programs unnecessary for commercial control of scab.

The tests reported were designed to investigate the possibility of developing a control program based on both of these eradicant methods, in the hope that such a program would reduce the number of fungicide applications necessary. Several small apple orchards at the Plant Industry Station at Beltsville, Maryland, were used for the tests.

All of the trees received the ground treatment. The orchard floor was sprayed with "Elgetol," a commercial preparation containing approximately 30 percent of sodium dinitro ortho cresol, during the late dormant period just before the buds began to crack open. The material was used in a 0.5 percent concentration by volume applied at the rate of 400 gallons per acre with a horizontal-type multi-nozzle boom at 400 pounds pressure. Since the spray from the boom did not quite cover the small strip lying in the tree rows, this area was sprayed in 1947 and 1948 by a man on the ground who used a 6-nozzle boom. In 1949 a horizontal-type boom designed by the Wisconsin Agricultural Experiment Station was used in the tests. This boom covers the areas lying in the tree rows.

In addition to the ground spraying with "Elgetol," part of the

FIRST AGAIN in pest control!

ORTHO
SCIENTIFIC PEST CONTROL
REG. U.S. PAT. OFF.

...the first name in Scientific Pest Control

Here is the year's BIGGEST news in FLY CONTROL...

LINDANE JUST APPROVED BY FEDERAL AUTHORITIES.

...and ISOTOX Dairy Spray containing LINDANE is available right now!

Here are the facts on ISOTOX Dairy Spray containing APPROVED LINDANE, the potent new insecticide with a 3-way residual killing power!

ISOTOX DAIRY SPRAY KILLS FLIES. New ISOTOX Dairy Spray, containing approved lindane, is the fastest fly control. It kills flies resistant to DDT and Methoxychlor. It kills flies *immediately* – they don't spin around half dead for hours. It kills flies by direct contact and by residual action for about 4 weeks, depending on the weather.

ACTUAL USAGE SUCCESSFUL. Dairymen for the past year—and experiment stations in New York, New Jersey, Texas, California, in addition to other areas – have been using ISOTOX. They report outstanding success in killing flies. Dairy pest control operator A. S. Lasley, Bellflower, Calif., says:

ISOTOX Dairy Spray will clean up a dairy quicker than anything I've ever used. DDT at its best used to take 6 to 12 hours to kill a fly. ISOTOX Dairy Spray drops them right on the floor! And I have found that a regular program of spraying with ISOTOX Dairy Spray will put the dairyman money ahead, because he gets a good cleanup of flies.

ISOTOX DAIRY SPRAY containing lindane is a wettable powder. It is used at the rate of 10 pounds to 100 gallons of water. It is packed conveniently in 1-pound and 4-pound cans and 20-pound pails.

OTHER USAGES. ISOTOX Dairy Sprays, containing lindane, is an excellent residual spray in buildings where dairy products are handled. Also ISOTOX Dairy Spray not only controls flies in and around dairy barns, farm buildings, manure piles and other fly-breeding places, but it may be used to control certain pests on livestock, such as ticks and lice on beef cattle, sheep ticks on sheep, lice on beef cattle, hogs, horses and sheep; scab or sarcoptic mange on dairy cattle, beef cattle, sheep and hogs. It also controls roaches, ants, mosquitoes and certain other insects.

ISOTOX Dairy Spray mixes readily with water for spraying. It can also be used as a paint around windows, doors, walls and ceiling beams – wherever flies gather. Directions for uses are printed on the label.

Phone your dealer or contact our offices listed below for immediate shipment. ISOTOX Dairy Spray will save you money through better pest control resulting in higher milk production.

CALIFORNIA SPRAY-CHEMICAL CORP.

Head Office: Richmond, California

Pacific Northwest: . . 815 E. Yamhill St., Portland, Oregon
Northern California: . . 515 N. 10th St., Sacramento, California
Central California: . . 675 Emory St., San Jose, California
San Joaquin Valley: . 3208 Hamilton St., Fresno, California
Southern California: . 202 No. Magnolia St., Whittier, California
Rocky Mountain: . . P.O. Box 428, Caldwell, Idaho

Middle West: . . . . . 705 Walnut St., Kansas City, Missouri
Southwest: . . . . . 610 Leonhardt Bldg., Oklahoma City, Okla.
Great Lakes: . . . . . P.O. Box 71, South Haven, Michigan
Northeast Atlantic: . . 150 Bayway Ave., Elizabeth, New Jersey
Western New York: . 147 Railroad Ave., Lyndonville, New York
Southeast Atlantic: . . P.O. Box 1231, Orlando, Florida

trees received applications of an eradicant fungicide known as 5 percent "Puratized Agricultural Spray" (phenyl mercury thiethanol ammonium lactate), at the rate of 1 pint to 100 gallons of water, on the young leaves and flowers and very small fruits. In 1947 two applications were made, at the preblossom (pink) and petal-fall (calyx) periods; in 1948 only one, at petal-fall. In the 1949 tests, phenyl mercury acetate was substituted for the "Puratized" compound and used at the same rate, at petal-fall only.

In the 1947 test, heavy frosts caused total failure of the fruit crop. Leaf counts of scab infection made during May and June indicated that some ascospores had escaped the ground treatment. Infection was observed in three Stayman Winesap and three Delicious trees that received the ground spray only. At this time infection was very light, but the season was favorable for secondary infections and considerable spread was observed on these nonsprayed trees later. At this early period infection was rarely found on the sprayed trees that had received the pink and calyx applications of the eradicant fungicide, but as the season advanced, infection developed to some degree in all trees. During the first week in September another leaf count was made. The percentage of diseased leaves was: on nonsprayed trees, 94.6 for Stayman Winesap and 65.7 for Delicious; on sprayed trees, 6 for Stayman Winesap and 2.7 for Delicious. It will be seen that the disease was very prevalent on the nonsprayed Stayman Winesap and Delicious apple leaves, but was of no consequence on either variety when the trees were sprayed with the eradicant compound. None of the trees received any further fungicide treatment after the eradicant application at the petal-fall period.

In 1948 a similar experiment was set up in the same orchard, but the effectiveness of only one instead of two applications of the eradicant tree spray was tested. The orchard floor of all plots was sprayed with "Elgetol," at the same concentration and rate as before, on March 30, about a week before the buds started to crack open. Ascospore development was found to be very much advanced at the time the ground application was made. "Puratized Agricultural Spray," at the same rate as before, was applied to the trees of the treatment plots at the petal-fall stage. Although the season was very favorable for early scab infection, none developed in the sprayed (both ground and tree sprays) trees and very little could be found in the nonsprayed (ground spray only) check trees during April or May. After this time, however, because of continued favorable weather for the scab organism, infection of the nonsprayed trees became noticeable and a slight amount developed in some of the sprayed trees. No fungicide sprays were used for the rest of the season. The spray schedule and results for 1948 are given in Table I. Leaf counts for scab infection were made in early September and the fruit counts at harvest time. None of the infected fruits from the trees receiving both the ground and petal-fall eradicant applications were diseased enough to consider them unfit for shipment or for consumption, whereas many of those harvested from trees that were ground sprayed only were severely diseased and most of them would have been culled out of a commercial pack.

The same type of experiment was carried on in the 1949 season, another favorable scab year, but phenyl mercury acetate was used at the rate of ½ pint of a 10-percent solution in 100 gallons of water at the petal-fall (calyx) period only, instead of the "Puratized" material. Results obtained were similar to those of the two preceding seasons. During the first week in June, after an extremely favorable infection period in May when almost 7 inches of rainfall was recorded, 16.1 percent of the leaves on the sprayed and 67.5 percent on the nonsprayed Delicious trees were observed to be diseased, while corresponding percentages for Stayman Winesap were 26.4 and 60.3 Infection on the leaves of sprayed trees was very light, whereas on nonsprayed trees it was much heavier.

In addition to the experiments at Beltsville, a commercial test, somewhat modified, conducted in an apple orchard near Cheswold, Delaware, during this same three-year period gave satisfactory results.

These experiments in these three seasons, when apple scab was generally prevalent and difficult to control in many orchards, indicate that the use of eradicant fungicides applied in two steps is of promise in the control of this disease: first, by eliminating a great deal of the ascospore inoculum in the diseased leaves on the orchard floor; second, by eradicating the early infections that develop on leaves and fruits from the small amount of ascospore inoculum escaping the floor treatment.

In those situations where it is possible, for various reasons, to use a ground spray, the orchardist has

(*Turn to page 77*)

TABLE I

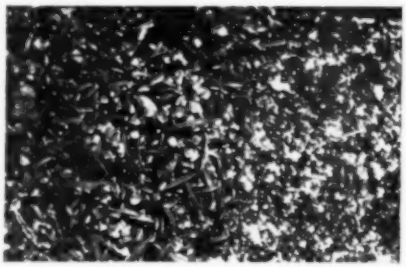
Control of leaf and fruit scab of apple trees by ground application and by ground plus tree application of eradicant fungicides, 1948 test

Variety	Treatment*	Percent of leaf scab**	Percent of fruit scab	Degree of fruit infection
Delicious	Ground only	92.6	61.0	Mostly severe
"	" & tree	13.0	16.2	" light
Stayman Winesap	" only	92.8	70.0	" severe
" "	" & tree	22.4	2.0	" light

* Ground spray = "Elgetol" 0.5 percent, 400 gallons per acre.
Tree spray = "Puratized Agricultural Spray," 1 pint per 100 gallons, at petal fall (calyx) only.
No fungicide applications during rest of season.

** Leaf scab counts were made early in September.

HERE'S WHAT MC-2 CAN DO!



Tobacco seed bed treated with MC-2. Note untreated area lower left corner.

The same bed six weeks later. Note grass and weeds in untreated area at left.

Kill Weed Seeds—Insects—Nematodes

Fumigate Seed Beds with . . .

→ DOWFUME MC-2

Dow research has developed a new, effective method of soil fumigation to control soil-borne weed and grass seeds, plant diseases, insects and nematodes in both indoor and outdoor plant beds—*throughout the tilled layer of soil.*

Dowfume MC-2 (a Methyl Bromide-Chloropicrin mixture) combines all the well known advantages of Methyl Bromide—high toxicity, excellent penetration, rapid action and ease of aeration—with the warning properties of Chloropicrin.

When properly applied under a gasproof covering, the new soil fumigant mixture—MC-2—is useful for treatment of seed beds, propagating beds, hot beds, cold frames, greenhouse ground beds, potting soils, compost, manure and local areas where trees and shrubs are to be planted.

In tests conducted in Michigan during 1948, Experiment Station personnel and individual growers who cooperated with Dow were well pleased with the quantity and quality of the plants grown in areas treated with MC-2. Seedlings grown in treated plots were earlier, more uniform, and sturdier after transplanting than those grown in untreated areas.

Get the facts! Write the Fumigant Division
The Dow Chemical Company,
Midland, Michigan

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

USE DEPENDABLE DOW AGRICULTURAL CHEMICAL PRODUCTS

WEED AND VINE KILLERS • INSECTICIDES • FUNGICIDES
SEED PROTECTANT • PLANT GROWTH REGULATORS
GRAIN AND SOIL FUMIGANTS • WOOD PRESERVATIVE

DOW

CHEMICALS INDISPENSABLE
TO INDUSTRY AND AGRICULTURE

Suppliers' Bulletins

Dow Booklet Available

Dow Chemical Co., Midland, Mich., has issued a new booklet, "Stop Fence Post Rot", which describes the use of its product "Dow Wood Preservative" (a pentachlorophenol concentrate) for this purpose. Treatability of various species of wood is discussed in the pamphlet. It is available from the company.

•

Conveyor Belt Catalog

Continental Gin Company's Industrial Division, Birmingham, Alabama, has recently issued "Engineering Data Book ID-481" describing the firm's line of "Continental Belt Conveyors". The book is well illustrated with both photographs and drawings of interest to engineers and operators of plants where conveyor belts are needed. Write to the company, care of Department A.

•

Milling Bulletin Issued

Sprout-Waldron & Co., Muncy, Pa., have issued a new 16 page equipment bulletin describing the firm's hammermills, attrition mills, pellet mills, mixers, and supplementary equipment. The booklet is thoroughly illustrated with both photographs and detailed drawings. Write for bulletin 45-B.

•

"Bughozzer" Applicator Booklet

Pamphlets describing the company's new product, "Bughozzer" are available from Accurate Tool Company, Insecticide Section, 15 Manufacturers Place, Newark 5, N. J. The product is an applicator for fertilizers, insecticides, fungicides or weed killers which automatically mixes a quart of toxicant with the stream of water from an ordinary tap so that it may be sprayed on a garden or larger area through a regular hose. Detailed drawings of the equipment are included in the pamphlet, with complete descriptive information.

•

New Lawrence Product

Lawrence Aero-Mist Sprayer Co., Greenfield, Mass. has recently added to its line of spraying equipment, the "Mist-O-Matic" orchard

sprayer. The machine has a 200 gallon insecticide tank, sufficient for 90 minutes of spraying, mounted on a trailer. It is operated by the driver of the tractor. The air dispenser is completely new, the company states. It consists of three 6-inch outlets which revolve at the rate of 18 revolutions per minute. With the sprayer going through an orchard at the rate of two miles per hour, it is calculated that the outlet makes three complete revolutions on every tree.

When the jets are in the top position for spraying, six times as much material is forced through them as when they are in the down position, the makers point out. This makes possible maximum coverage at the crown of the tree. Demonstrations have been made in fruit orchards in New York State and in New England.

The company has also announced an attachment which can convert "Aero-Mist" sprayers into either dry or wet dusters. The development was made to fulfil agricultural spraying requirements which use a dusting compound for insect control. The makers state that the added dust hopper does not interfere with the normal use of the sprayer, and is easily attached or detached.

•

Dust Collectors Described

American Wheelabrator & Equipment Corp. has just issued a folder on controlling dust in the pesticide industry. The folder, designated as bulletin No. 202, presents pictures and reports of typical installations of dust collectors, and describes in detail the equipment itself. Copies of the industry report may be obtained by writing to the American Wheelabrator & Equipment Corp., 555 S. Byrkit St., Mishawaka, Ind.

•

Hercules Toxaphene Folders

Hercules Powder Co., Wilmington, Del., has recently issued three new bulletins on toxaphene as an effective control for armyworms, sugar beet webworms and peanut insects.

The folder entitled "Toxaphene Kills Armyworms" describes the pest, and tells how it may be controlled with this insecticide. Two other folders are of similar nature, giving corresponding information. Copies of all are available from the company in Wilmington.

•

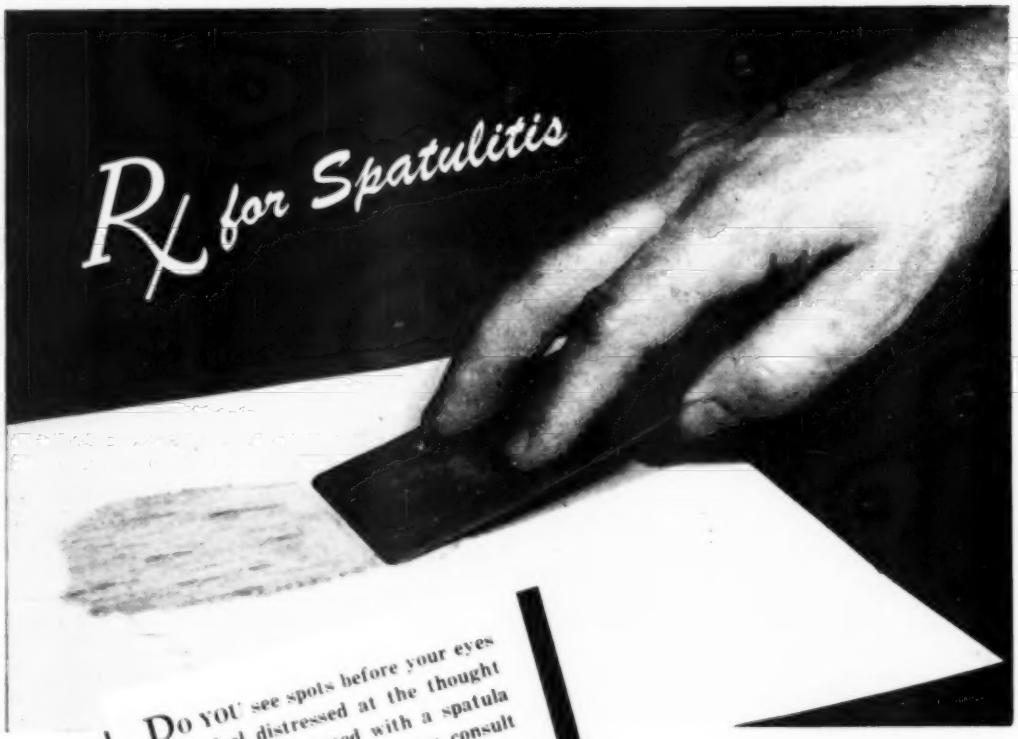
Calspray Offers Lindane Spray

California Spray-Chemical Corp., Richmond, Calif., has announced the availability of its new product, "Isotox Dairy Spray," containing 25 percent lindane.

•

Gen. Chem. Catalog Offered

General Chemical Division of Allied Chemical & Dye Corp., has issued a new ring-bound catalog and description of its products. The section on agricultural chemicals lists the Division's insecticide, fungicide and weedkiller products, sold under the trade marks of "Genitox", "Geniphene" and "Orchard Brand". The books are bound so that subsequent catalog sheets may be included later. Copies are available from the company, 40 Rector St., New York 6, NY.


Rx for Spatulitis
DO YOU see spots before your eyes . . . feel distressed at the thought of a customer armed with a spatula . . . then it's high time you consult Sprout-Waldron & Co.

A CAREFUL diagnosis would probably reveal a lack of uniformity in your insecticide product — caused by inefficient or outmoded equipment . . . unsuited to the specialized job of producing a lump-free blend of high uniformity.

In over 30 states, satisfied users of Sprout-Waldron Intimate Blending Systems keep their customers happy. They have found the cure for SPATULITIS through low-cost, quality production.

As so successfully demonstrated in widely diversified installations, a Sprout-Waldron System is adaptable to the most rigid requirements of every dust producer.

When you buy Sprout-Waldron, you get a complete system engineered and specified in every detail by experienced men for greater production and a top quality product. The extras are: high efficiency . . . low operating costs . . . a safe, dust-free plant.

We believe that you realize the importance of planning now for your Intimate Blending System. Accordingly we are prepared to make specific recommendations to meet your individual installation requirements anytime at your convenience. Consult Sprout-Waldron and Company, 7 Waldron St., Muncy, Pennsylvania.

SPROUT WALDRON
Manufacturing Engineers

Technical Briefs

Use of 2,4-D in Flax

Reports from throughout the northwest flax belt indicate that spraying of 2,4-D has been nearly 100% successful in flax this past year. Since farmers have learned that a slight wilting of the flax plant immediately after spraying is normal, there have been few complaints of crop damage. Several North Dakota farmers have reported greater rust injury in sprayed fields. It is believed however, that any increase in rust damage resulted from delayed maturity rather than from greater susceptibility. 2,4-D sometimes retards the growth of the flax plant just enough so that it is exposed to weather conditions more favorable to rust development. Such flax may appear more susceptible to rust than unsprayed portions of the same field which were able to mature normally before rust conditions prevailed.—*Flax News Letter*, July 29, 1949.

■

HETP for Cabbage Aphid

Tests have indicated that the cabbage aphid may be controlled by a five per cent dust of hexaethyl tetraphosphate, or by use of a spray containing one part of HETP to eight hundred parts of water. The spray attacks the porcelain lining of spray gun cylinders. *J. Econ. Entomol.* 42, 156-7 (1949).

■

Feed BHC to Cattle

Benzene hexachloride containing 13 per cent of the gamma-isomer was fed in varying amounts to cattle with the following results: (1) A dose of .5 grams per kilogram fed on two consecutive days was toxic to the cattle; however, a dose of .25 grams per kilogram fed to the cattle on two consecutive days, followed by a dose of .125 grams per kilogram on the third and fourth day was tolerated by the cattle, and a sufficient quantity of the insecticide was in the blood stream to kill feeding tsetse flies (*Glossina palpalis*) and ticks up to 41 days after administration. (2) A single dose of .25 grams of the benzene hexachloride per kilogram did not prevent East Coast fever in animals grazing on heavily infested pastures. (3) Calves exposed to ticks and fed weekly with doses of .125 to .25 grams per kilogram of the insecticide were protected against the East Coast fever. A dose of .1 gram per kilogram under the same conditions was ineffective.

Concentrations of .3 grams per kilogram of benzene hexachloride containing 13 per cent of the gamma-isomer are toxic to young animals. Higher concentrations are tolerated by the older cattle. The 13 per cent "Gammexane" is less toxic than the pure gamma-isomer. Concentrations of .25 and .5 grams of DDT per kilogram are tolerated by cattle.

A mortality of 28% of tsetse flies feeding on treated cattle was observed in 24 hours. *Bull. Entomol. Research* 39, 423-34 (1948).

■

Study Fly Resistance to DDT

The chief factor involved in the failure of DDT residues to control house flies under conditions in which the treatments had been highly successful previously, appears to be an increased resistance of the flies to this insecticide. This is probably a result of exposure in treated buildings over a period of from 1 to 4 years.

Samples of flies obtained from seven localities in five states all showed a greater resistance to DDT residues than that of two laboratory colonies that had never been exposed to the compound. All samples, however, were much more susceptible than a special resistant colony that has been developed experimentally at Orlando, Fla., during the past 32 months.

No evidence has been obtained that inferior quality DDT used this year was involved, or that freshly applied residues on the walls of buildings were less toxic than formerly.

Heavy deposits of DDT (0.8 to 4 gm. per square foot) showed some repellency to flies, but the more usual dosage of 0.2 gm. was practically nonrepellent. Heavy deposits of wettable chlordane and methoxychlor were nonrepellent or even slightly attractive. Technical benzene hexachloride was somewhat more repellent and a partially refined product somewhat less repellent than DDT.

Preliminary tests indicated that the increased resistance to DDT was much greater than it was to methoxychlor, chlordane and benzene hexachloride. Respraying of two barns with chlordane emulsions and two with suspensions of methoxychlor, provided a high degree of control for several weeks.—W. V. King and J. B. Gahan, in *J. of Economic Entomology*, June, 1949.

■

IPC Tested at Clemson

Prompted by reports from various experiment stations on results of efforts to control grasses with herbicides, investigators at the South Carolina station, Clemson, S. C., undertook a series of tests with 2,4-D and IPC (isopropyl-N-phenyl carbamate) for control of nut grass, Johnson grass and Bermuda grass, common in that area.

Greenhouse flats of approximately 0.6 cu. ft. capacity were used, with a clay loam soil treated with the two herbicides at rates of 4 and 8 lbs. per acre. In a flat of nut grass, treated with the sodium salt of 2,4-D, at 4 lbs. per acre, inhibition of growth, except for one stunted chlorotic sprout, was complete.

In another flat of Johnson grass treated with 2,4-D at 4 lbs. per acre, stunting and retardation of growth was marked, but, since

VC PRODUCTS

V-C FERTILIZERS

Complete Fertilizers
Concentrated Superphosphate
Phospho Plaster
Superphosphate
Sulphuric Acid

V-C CHEMICALS

Phosphorus
Phosphoric Acids
- Technical Grade
- 85% N.F. Grade
- 75% Food Grade
- 62½% Commercial Grade

Sodium Phosphates
- Disodium Phosphate (Technical and Drug Grades)
- Trisodium Phosphate
- Tetrasodium Pyrophosphate
- Sodium Tripolyphosphate

Calcium Phosphates
- Monocalcium Phosphate
- Lucky Leaven" Phosphate
- Phosphate Paste

V-C PHOSPHATE ROCK PRODUCTS

Phosphate Rock, Ground and Unground
Calcined Phosphate Rock
Nodulized Phosphatic Materials

V-C BAGS

Burlap Bags
Cotton Bags
Paper Bags

V-C CLEANSERS

The Vicar" Line of Cleansers

V-C FIBERS

Vicara" Textile Fibers
Zycon Fibers

VIRGINIA-CAROLINA CHEMICAL CORPORATION
General Offices:
401 East Main Street, Richmond, Virginia

"Black Leaf" PESTICIDES

Black Leaf 40—for spraying fruits, vegetables, and flowers to control aphids and similar sucking insects. Also used to control certain external parasites of cattle, sheep, and poultry—and as a drench for sheep.

Black Leaf Dry Concentrate—a dry powdered nicotine compound that combines the versatility of Black Leaf 40 with the convenience of a dry product.

Black Leaf 155—a "fixed" nicotine compound for spraying apples and pears to control codling moth, also for controlling grape berry moth and citrus thrips.

Black Leaf 10 Dust Base—a "free" nicotine compound, easy to mix with non-alkaline carriers to make a neutral dust.

Black Leaf Garden Dust—a multi-purpose dust or spray containing nicotine, pyrethrum and rotenone—*plus* a concentrated fungicide.

Black Leaf Rotenone Dust—1% rotenone and sulphur, blended on our special carrier material.

Black Leaf Mash-Nic—for controlling the large roundworm (Ascaridia galli) in chickens. A "single-shot" treatment.

Nico-Fume Liquid—contains 40%, actual nicotine in a "free" form—for greenhouse spraying and fumigating to control aphids and similar sucking insects.

Nico-Fume Pressure-Fumigator—spreads penetrating nicotine fumes under pressure to control aphids and similar sucking insects in the greenhouse.

Benzo-Fume Pressure-Fumigator—for the control of greenhouse red spider mites.

TOBACCO BY-PRODUCTS & CHEMICAL CORPORATION
Richmond, Va. • San Francisco, Calif.

rhizomes were not killed, it was thought probable that in time the Johnson grass would have re-established itself. When the soil was treated with IPC there was not the slightest evidence of damage to any of the three grasses treated. The IPC was added in a solution of propylene glycol-ethyl alcohol and also in an oil-water solution and it was suggested that, if other solvents had been used, the IPC might be more or less effective against these grasses.

In flats planted to Bermuda grass 2,4-D caused less retarding of growth than occurred in nut grass and Johnson grass, although growth was not noticeably decreased.

Flats of soil treated with 2,4-D (sodium salt) at 8 lbs. per acre were planted to cotton and snap beans 71 days after treatment. There was no evidence of damage to these plants, which are relatively sensitive to 2,4-D, and the report comments that apparently the toxicity of 2,4-D in the soil is relatively transient.

Application of 2,4-D, it was concluded, must be studied under field conditions where thorough mixing of the herbicide with the soil, soil moisture and other factors are not under control, before specific recommendations can be made for its use in controlling Johnson and nut grasses.

•

DDT For Corn Earworms

A five per cent DDT dust applied to the silks of sweet corn has proved highly effective in controlling the corn earworm, said to be more difficult to combat than the European corn borer.

The pest is most serious on Long Island and in the lower Hudson Valley of New York, but last season it was unusually abundant in other sections of the State as well. Most of the serious ear damage occurs during the last six weeks of the growing season.

Control is directed against the young worms which hatch from eggs laid on the silks. These worms must be destroyed before they reach the developing kernels if satisfactory results are to be obtained.

Excellent control has followed applications of five per cent DDT dust made to the silks, starting four days after about half of the silks first become visible. Two to three dust applications are needed at two-day intervals. A single application has not given satisfactory control. A rotary hand duster with a "Y" outlet and two nozzles makes possible the treatment of two rows simultaneously.

Chemical analyses of treated ears showed no DDT to be present on the husked ears, although residues were present on the discarded husks. DDT dust must be used with caution on sweet corn to be offered for sale and treated stalks should not be fed to livestock.

When safe and effective insecticide treatments are worked out for the corn earworm, it is believed that the use of mounted row-crop dusting equipment in large corn plantings will be entirely practical. —New York State Agr. Station Progress Report No. 7262.

Experiment Station Bulletins

Bulletin on Cattle Pests

A summary of the results of research on various new insecticides for use on external parasites of livestock is presented in pamphlet E-762 by the United States Dept. of Agriculture, Bureau of Entomology and Plant Quarantine.

Considered are the performance of different insecticides on livestock pests, and the toxicity and potential hazards to man and animals. Presented also are suggestions for the limitations and specific uses of the insecticidal materials, including DDT.

•

Aerosol Spray Bulletin

Maryland Agricultural Experiment Station, College Park, Md., announced in its 61st annual report for 1948, the development of equipment for applying liquified gas aerosols while cultivating a bean crop, for control of Mexican bean beetle. This dispenser, named a "cultisoler," consists of a hood enclosing the spray nozzle which is attached just over the shovels of the cultivator, to make possible the spraying of the plants while loosening the soil. Tests with rotenone-pyrethrum aerosols on approximately 500 acres of snap and lima beans gave satisfactory bean beetle control where treatments were applied early, before plants were severely injured by the pest and while they were not too large to be easily covered by the spray.

•

Georgia Tobacco Bulletin

"The Relative Efficiency of Different Forms of Nitrogen in Flue-Cured Tobacco Production" is the title of Circular 14, issued by the Georgia Coastal Plain Experiment Station, Tifton, Ga. The bulletin presents data on ammonium sulfate, nitrate of soda, cottonseed meal and urea as employed in the growing of tobacco plants. Tables are presented to show expenditures in dollars per acre, per year, and a five year average cost.

•

Weed Control Booklet Out

Oklahoma Agricultural Experiment Station, Stillwater, has issued Bulletin No. B-335, "Chemical Control of Weeds and Brush in Oklahoma." The booklet contains general information on herbicides, specific data on 2,4-D and its methods of application, formulation and recommended dosages.

Other herbicidal chemicals mentioned include ammonium sulfamate, sodium chlorate, borax, 2,4,5-T, IPC and Stoddard Solvent. Treatment of pastures, lawns,

(*Turn to page 82*)

DOUBLE CHECKED from RESEARCH to INDUSTRY

SHARSOL

For Solubilizing 2,4-D Acid

SHARSOL 193, triethylamine, is an outstanding solubilizer for 2,4-D.

IT IS:

Easy to formulate . . . Five pound per gallon concentrates—even 60% concentrations—can be formulated.

Economical

CONCENTRATES HAVE:

Excellent resolubility after freezing
Lower viscosity
Low freezing point
Good hard water tolerance when diluted to use concentration.

For samples and further information, write to Dept. E

SHARPLES TRADE MARK CHEMICALS

SHARPLES CHEMICALS INC.

PHILADELPHIA CHICAGO NEW YORK

ETHYL, BUTYL AND ISOPROPYLAMINES • AMYL CHLORIDES • AMYL ETHER
UREA DERIVATIVES • AMYL MERCAPTAN • CORROSION INHIBITORS
RUBBER CHEMICALS • DITHIOCARBAMIC ACID DERIVATIVES
ALKYLOLAMINES • AMYL ALCOHOL • AMYL ACETATE • HYDROCARBONS

INDUSTRY NEWS

A. L. Ivey Dies Suddenly

A. Lynn Ivey, president and a director of Virginia-Carolina Chemical Corp., Richmond, Va., died suddenly August 18 while boarding a train in Richmond to attend a meeting of the board of

A. Lynn Ivey

Directors in New York. He was 65 at the time of his death.

His first connection with V-C was in 1917 as a counsel, which post he held for many years. In 1934, Mr. Ivey, then vice-president and general counsel of the company, was elected president to succeed George A. Holderness. During the following year, a rift among the board of directors caused the temporary dismissal of Mr. Ivey in favor of F. S. Gibson who was named president. This situation obtained but two months, however, after which time Mr. Ivey was re-elected and remained in office until his death.

Born on a farm in Georgia, Mr. Ivey studied at the North Georgia Agricultural and Mechanical College of the University of Georgia, and received a B.S. from the school in 1908. He was commandant of the Georgia Military College before being graduated from the Columbia University Law School in 1915. He later practiced law in Richmond, Va., and was at one time Assistant Solicitor General of the Atlanta Judicial Circuit in Georgia.

His company operates fertilizer plants in 14 states, and owns phosphate rock mines in South Carolina, Tennessee and Florida; has 18 sales offices throughout the U.S. Tobacco By-Products & Chemical Corp., producers of insecticides, is a wholly-owned subsidiary. V-C last October moved into its new offices in Richmond, which serves as headquarters for the entire organization.

MEETINGS

National Agricultural Chemicals Association, Essex & Sussex Hotel, Spring Lake, N. J., September 7–9, 1949.

New Jersey Fertilizer Conference, Rutgers University, New Brunswick, N. J., September 29, 1949.

American Chemical Society, annual meeting, Atlantic City, N. J., October 18–23.

American Association of Feed Control Officials, Shoreham Hotel, Washington, D. C., October 5.

Association of American Fertilizer Control Officials, Shoreham Hotel, Washington, D. C., October 7.

Association of Economic Poisons Control Officials, Shoreham Hotel, Washington, D. C., October 8.

Association of Official Agricultural Chemists, Shoreham Hotel, Washington, D. C., October 10–12.

National Pest Control Association, Biltmore Hotel, Los Angeles, Calif., October 17–19.

American Society of Agronomy, Milwaukee, Wisconsin, October 24–28, 1949.

California Fertilizer Association, 26th Annual Convention, Palace Hotel, San Francisco, Calif. November 7, 8, 9, 1949.

North Central Weed Control Conference, Sioux Falls, S. D., Dec. 6, 7, 8, 1949.

American Association of Economic Entomologists, 61st Annual Meeting, Tampa, Florida, December 13, 14, 15, 16, 1949.

American Phytopathological Society, Martinique Hotel, New York, December 28, 29 & 30. (In conjunction with American Association for Advancement of Science)

Northeastern States Weed Control Conference, Hotel New Yorker, New York, January 3–5, 1950.

Western Weed Control Conference, Denver, Colorado, January 31 to February 2.

New Investigation Looms

A resolution, almost identical in detail with the one introduced by Frank B. Keefe earlier in the year, was introduced into Congress on August 10 by Rep. Adolph Sabath, Democrat, of Illinois. Mr. Sabath's resolution, like the previous one, provides for the creation of a special committee to investigate the toxicity of insecticides and other pesticides, chemical food emulsifiers and fertilizers.

Industry observers thought it likely that the resolution should receive action by the House before adjournment, in which case an investigation could be held during the recess period. Rep. Sabath is chairman of the House Rules Committee, where the Keefe resolution has laid dormant for several months.

•

Offers Weed Applicator

Gro-Quick Co., 340 Huron St., Chicago, has announced a new device for applying a herbicide to weeds individually. Called a "Weed-Wand," it resembles a cane and has an inner plastic tube with a cork cap, through which 2,4-D flows by capillary action, to treat one weed at a time. Soil is not harmed and the danger of spreading the chemical to grass or shrubbery is avoided, the makers claim.

•

Calspray Office Moved

California Spray-Chemical Corporation has announced that its Oklahoma City office has moved to a new location in the Leonhardt Building located at N.W. 2nd Street at Harvey. The telephone number, 7-6468, will remain unchanged.

Building Up Your Name
. . . means better business for both of us
Your name on a finished insecticide means a lot to us. That's why we do not compete with you . . . do not furnish finished insecticides to dealers or ultimate consumers. This Powell policy strengthens your position in your area . . . means sounder growth for you — for both of us.
We want to see that growth. That's why we offer these down-to-earth helps to all formulators of finished insecticides.
• A COMPLETE LINE of insecticide raw materials – technical grade or concentrates – whatever your needs may be.
• CONTRACTS if desired to assure you of supplies when needed, and price protection to time of delivery.
• MERCHANDISING HELP with labels, manufacturing formulae, advertising guidance, technical service and laboratory tests.
• MANAGEMENT ASSISTANCE when you need help to solve a financial or growth problem.
Yes, your success is so vital to us that we will not compete with you. Our policy is to supply basic insecticide materials to insecticide manufacturers exclusively for packaging under their own labels.
Your name on those labels means better business for both of us.
John Powell & Co., Inc.
ONE PARK AVENUE, NEW YORK 16, N.Y.
Sales Offices: Chicago • San Francisco • Pittsburgh • Philadelphia • Fort Worth
Canada: Charles Albert Smith, Ltd., Toronto, Montreal • In Argentina: John Powell y Cia
Representatives in Principal Cities of the World
POWCO BRAND
DDT POWDERS AND LIQUIDS
CHLORDANE POWDERS AND LIQUIDS
PYRETHRUM POWDERS AND EXTRACTS
PYRINS
AEROSOL FORMULATIONS
STIMTOX A
PYRISCENTS (insecticide perfumes)
BOTANICALS • ROTENONE • SABADILLA
ANTU
2,4-D AND INPC WEED KILLERS
BHC POWDERS AND LIQUIDS
COTTON DUST CONCENTRATES
TOXAPHENE POWDERS AND LIQUIDS
TETRAETHYL PYROPHOSPHATE
look to Powell for Your needs

VELSICOL for
INSECT TOXICANTS
SOLVENTS
- Household and Agricultural Concentrates
- Wood Preservative Formulations
- 2, 4-D Ester Formulations

"VELSICOL"

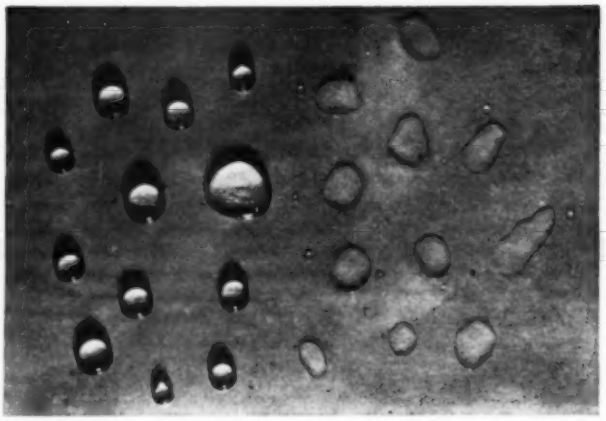
VELSICOL Corporation

General Offices: 330 East Grand Avenue, Chicago 11, Illinois
Branch Offices: New York • Detroit • Cleveland

Manufacturers of: Insect Toxicants • Aromatic Solvents • Petroleum Derivatives • Core Oils

Representatives in Principal Cities

With Water and Oil at Their Command . . .



The large drops are typical of the way an aqueous spray stands in nearly round globules. Beside them are drops to which an Atlas surface active agent has been added.

Atlas Emulsifiers Can Help You Improve Your 1950 Compounds!

ATLAS EMULSIFIERS do more than just control the wetting and spreading power of your insecticide or weed-killer. Frequently, they step up killing power, too—might easily result in substantial savings in toxicant or solvent because of formulation improvements.

Compounders of insecticides and herbicides are talking over their plans for 1950 improvements with Atlas emulsifier specialists now! Here's how we may be able to help you:

Improve Toxicant Activity. Research proves that merely adding more toxicant to your formula doesn't always improve killing power. On the other hand, adjusting the quantity of emulsifier may step up the kill many fold! Are you wasting valuable toxicant or solvent ingredient?

Tailor-make Your Formula To Suit Your Requirements. Atlas helps you select the correct emulsifier based on such factors as: (1) cost; (2) spray or other application equipment used; (3) kind of water to be used for dilution; (4) spreading and wetting properties desired—and many other factors.

Why not get in touch with the Atlas insecticide emulsifier specialists today? As a starter, write for our latest insecticide emulsifier bulletin containing many valuable hints and typical formulas.

ATLAS INDUSTRIAL CHEMICALS DEPARTMENT

CHEMICALS ATLAS EXPLOSIVES

ATLAS POWDER COMPANY, Wilmington, Del. • *Offices in principal cities* • *Cable Address—Atpowco*

In Canada address A. F. Sterne and Sons LIMITED *Brantford, Ontario*

Four Meetings Set for Washington in October

THE annual meetings of four associations are scheduled for eight consecutive days at the Shoreham Hotel, Washington, D. C., beginning October 5. The National Association of Feed Control Officials will open the series with a two-day session, followed on October 7 by the Association of American Fertilizer Control Officials. The Association of Economic Poisons Control Officials will convene on Saturday, October 8, for a single day's program. No official meetings are scheduled for Sunday, October 9, but on Monday, the Association of Official Agricultural Chemists, Inc., will open a three-day conference which is due to terminate on the 12th.

According to Dr. L. E. Bopst, College Park, Md., secretary of the Feed Control Officials group, speaking sessions and conferences will occupy most of the program of the two-day event, with a business meeting and election of officers.

The Fertilizer officials, according to Dr. B. D. Cloaninger, Clemson, S. C., president, will feature a concentrated day of discussions to which the fertilizer industry is invited.

Talks by Dr. H. J. Hoffman, St. Paul, Minn., president of the Association of Economic Poisons Control Officials and by Dr. P. B. Dunbar, commissioner of the Federal Food and Drug Administration, Washington, are to be included in the program of the A.E.P.C.O., according to Dr. A. B. Heagy, College Park, Md., secretary of the association. Other speakers listed on the tentative program are Dr. Charles H. Mahoney, director, National Canners' Association; Lea S. Hitchner, executive secretary and treasurer, National Agricultural Chemicals Association; and a representative of the National Association of Insecticide and Disinfectant Manufacturers. Industry representatives are to be welcomed, the secretary states.

Following the recess of Sunday, the A.O.A.C. convenes on Monday. Henry A. Lepper, secretary-treasurer of the Official Agricultural Chemists stated that printed programs would be available early in September, but none were available at press time late in August.

•

Acmeline Makes Appointments

Acmeline Mfg. Co., Traverse City, Mich., has announced that G. G. Carpenter has been appointed

Mr. Carpenter Mr. Rowe

general manager and H. H. Rowe, general sales manager, effective as of August 1. Both Mr. Carpenter and Mr. Rowe have been associated with the Dobbins Mfg. Co., Elkhart, Indiana for the past ten years. Before that, Mr. Rowe was with Lowell Mfg. Co., Lowell, Mich. and Mr. Carpenter with Lindsay Bros. Co., Minneapolis.

Herbert P. Boughey, recently holding the position of acting general manager, has been appointed as sales representative to handle the entire line in the central states territory, the firm has announced.

The company has made extensive plans for expanding sales and production of its line of sprayers, dusters and hand planters which were first offered to the trade through wholesale channels over 75 years ago.

•

Pest Control Ass'n to L.A.

The seventeenth annual convention of the National Pest Control Association will be held at the Biltmore Hotel, Los Angeles, Calif., October 17–19, according to an announcement made by the association secretary, William O. Buettner, Brooklyn, N. Y.

Among the speakers expected to appear on the program are Dr. S. A. Rohwer, Assistant Chief, Bureau of Entomology and Plant Quarantine, U.S.D.A.; Walter W. Dykstra, U. S. Fish and Wildlife Service; Dr. Thomas E. Snyder, B.E.P.Q., Dr. A. M. Boyce, Riverside, Calif., president, American Association of Economic Entomologists; and a number of speakers from the University of California.

Particular emphasis will be laid on the control of wood-destroying organisms, with special attention to the subterranean termite, Mr. Buettner stated. A panel on this subject is being planned. Other sections of the meeting will hear discussions on control of house mice, the general insecticide situation, and on pest control legislation in a number of states.

Entertainment will be provided at a dinner on Tuesday evening, and a business session will occupy a portion of Wednesday morning's program. New officers will be elected, and reports of various committees will be heard.

Present officers of the N.P.C.A. are: V. H. Montgomery San Francisco, president; William O. Buettner, secretary; and Robert C. Yeager, Cincinnati, Ohio, treasurer.

•

Announces Mist Blower

Homelite Corporation, Port Chester, New York, has announced a new product, the "Homelite Mist Blower" for use with all concentrates. The makers describe the machine as being light in weight, compact, of high velocity, and capable of applying wettable dust, miscible oils and various insecticides. Driven by a gasoline motor, the blower generates a velocity of 170 gallons per hour and will cover trees up to 50 feet tall, it is claimed. Rate of spray may be varied to suit the conditions, and the machine may be mounted in the back of a pickup truck, jeep, light trailer or tractor. Full details may be had from the company.

But experience does prove farmers often get larger yields, finer quality crops on magnesium-deficient soils with . . . **Sul-Po-Mag**

Water-Soluble

Double Sulfate of Potash-Magnesia

Your farm customers naturally don't expect to grow tobacco as big as this, even with *Sul-Po-Mag*.

They *do* expect to get earlier maturity, healthier growth, fine quality and larger yields of many different crops by using *Sul-Po-Mag* where there is evidence of magnesium deficiency in the soil.

Sul-Po-Mag supplies both potash and magnesium in a properly-balanced, natural combination in the most practical and economical way. Both the potash and magnesium are in water-soluble form and are quickly available to crops.

Sul-Po-Mag is produced exclusively by International from langbeinite ores at its Carlsbad, New Mexico, mines. It is available to you now in larger quantities than ever before to help you satisfy the rapidly growing demand of farmers for plant foods required to meet magnesium-deficient conditions in their soil.

SUL-PO-MAG (Water-Soluble Double Sulfate of Potash-Magnesia)
MURIATE OF POTASH • SULFATE OF POTASH

POTASH DIVISION • INTERNATIONAL MINERALS & CHEMICAL International **CORPORATION**

GENERAL OFFICES: 20 NORTH WACKER DRIVE, CHICAGO

Economic Poisons at A.C.S.

The Division of Agricultural and Food Chemistry of the American Chemical Society will hold its sessions on Monday, September 19, as part of the all-week program of the ACS in Atlantic City, N. J.

The section on Economic Poisons, will be under the chairmanship of Dr. J. L. St. John, Washington State College, Pullman, Wash. Speakers listed on the advance program include L. S. Hitchner, National Agricultural Chemicals Association, Washington, D. C. and Dr. Charles E. Palm, Head, Department of Entomology, Cornell University, Ithaca, N. Y. They will discuss the importance of pest control chemicals in food production and problems in the development and use of synthetic organic insecticides, respectively.

Other topics to be discussed in the meeting of this section include "The Concentration of DDT in the milk and tissues of dairy cows fed DDT-dusted alfalfa hay"; "The origin and development of 2,4-D"; "Organic chlorine determinations as a measure of the insecticide residues in agricultural products"; and "The importance of toxicological investigation by industry."

The section on economic poisons will be held in the Rose Room of Hotel Traymore, Atlantic City. (The Division of Fertilizer Chemistry, to meet on Monday afternoon, is reported elsewhere in this issue.)

•

Shade Tree Meeting Held

The National Shade Tree Conference was to observe its 25th anniversary with a four-day convention beginning August 23, at the Lord Baltimore Hotel, Baltimore, Md. Although the program placed emphasis on the care of shade trees and procedures in this regard, a number of topics were to be discussed in the agricultural chemical field.

Among these, according to the pre-convention program, were the following: "Fertilizer Applications by Foliage Sprays", by Dr. Damon Boynton, Cornell University; "Trace Elements and Their Role in Plant Nutrition", by Dr. H. L. Crane, U. S. Department of Agriculture, Beltsville, Md.; "Boxwood Nematode Control," by Dr. Gotthold Steiner, U. S. Department of Agriculture, Beltsville; and "Control of Some Troublesome Insects", by Dr. E. N. Cory, University of Maryland, College Park.

A symposium was to be held, in which pest control in shade trees would be discussed. The meeting will be reported in full in our October issue, it having been held too late in the month to be included with this number.

•

Holland Meeting for 1950

The Fourth International Congress of Soil Science is planned to be held in Amsterdam, Netherlands, during the summer of 1950, it has been announced. The dates set are July 24 to August 1. Object of the meeting is to enable scientists of different nations to exchange news of scientific progress made during recent years, and to renew relations.

Foundation of a new International Soil Science Society at the congress is intended, and a Temporary Advisory Committee of soil scientists from 16 nations has started work on preliminary plans for organization of the society.

In addition to general lectures delivered before the whole congress, special programs are planned for the sections on soil physics, on chemistry, on soil biology, on soil fertility, on tropical and subtropical soils, on soil conservation and management, on land classification and evaluation, and on saline soils.

After the congress, members may join an excursion through the Netherlands and Belgium which will visit the island of Walcheren, the greenhouse center of the Westland, the fruit area on the river clay, the Zuiderzee works, the reclamation of new sea clay soils on the northern coast, peat soil reclamation, and the three Belgian centers of soil research, Louvain, Ghent and Gembloux.

Previous international soil congresses were held in Washington in 1927, in Leningrad and Moscow in 1930, and in Oxford in 1935.

Application blanks and further information may be obtained from the Secretary of the Organizing Committee of the Fourth International Congress of Soil Science, 3 van Hallstraat, Groningen, Netherlands.

•

New Western Farm Service

The "Farm Service Corporation" has been established in Portland, Oregon, to supply farmers of the three coast states with fertilizers, insecticides, weed killers, fungicides, spray and dusting equipment, livestock remedies, etc. According to Lee Fryer, president and general manager of the firm, the long-range objective of the company is to develop service units throughout the rural areas to offer diversified services to farmers. These services would include soil testing facilities and a laboratory, as well as farm engineering and management aid, and accounting and tax counsel.

Coast headquarters for the corporation, incorporated in Oregon in July with a capital authorization of more than $200,000, will be maintained at the Lumbermens Building in Portland. Branch offices are located at 4260 W. Marginal Way, Seattle, where the company is completing construction of a fertilizer mixing plant; and at 819 Santee St., Los Angeles. California operations will be under the direction of Harry Mishkin, vice-president of Farm Service Corp.

•

Chemical Exhibit Planned

Organization of the 22nd Exposition of Chemical Industries is well under way, with the event planned to be held in Grand Central Palace, New York, November 28 to December 3. Manufacturers of chemicals for agricultural use are expected to be among the exhibitors.

RICELAND RICE HULLS

are the perfect conditioner for

Chemical Fertilizers

- ✔ Scientifically dried and ground especially for fertilizer conditioning.
- ✔ Available in fine ground No. 16, medium ground No. 14 and coarse ground No. 12.
- ✔ Used and preferred by leading fertilizer manufacturers.
- ✔ Available in large volume the year 'round.
- ✔ Shipped in bulk or 100-pound burlap bags (25 to 40 tons per car).
- ✔ Very inexpensive.
- ✔ Wire, phone or write for free sample and price.

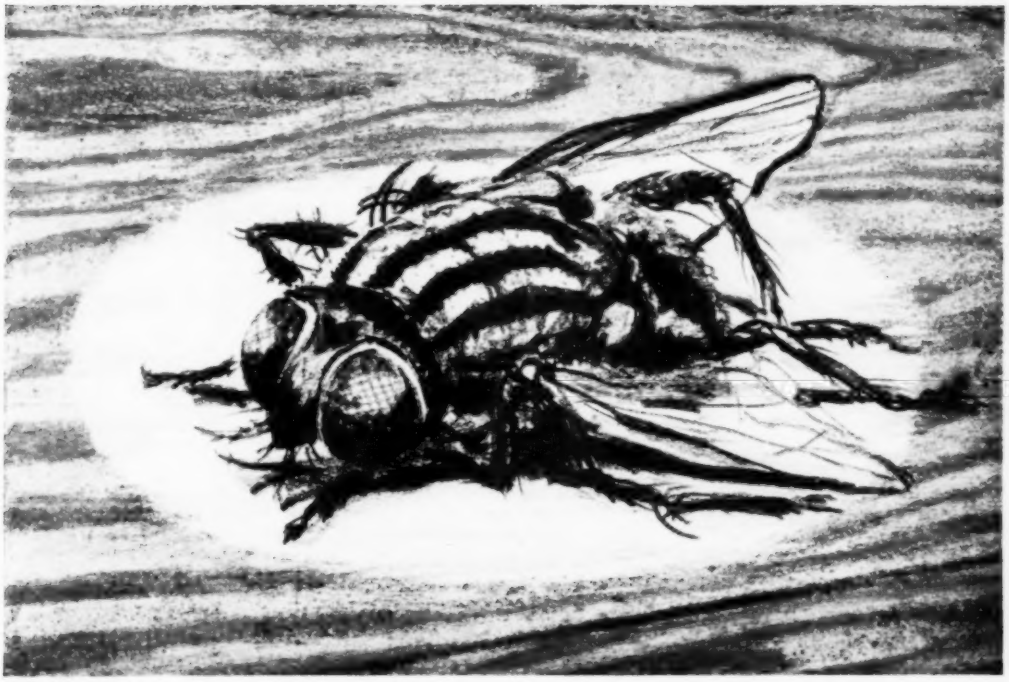
RICELAND RICE HULL DIVISION

ARKANSAS RICE GROWERS CO-OP ASS'N.

STUTTGART, ARK. • PHONE L. D. 10

World's largest rice growing, milling, storage and marketing organization.

World's largest year 'round supplier of rice hulls to fertilizer manufacturers.



Now MARLATE tags him *OUT*

There's no one perfect material to kill insects today—without danger to humans or animals or crops. But Du Pont has now come closer to the ideal with "Marlate" methoxychlor insecticide. It has many of the cardinal virtues for such a product.

First, "Marlate" has an unusually high factor of safety to sensitive plants . . . it doesn't burn cucurbits, beans or tomatoes, for example. Likewise, tests thus far show that residues of this chemical are remarkably low in toxicity to warm-blooded animals.

Second, "Marlate" controls many insects . . . on fruit, on vegetables, on livestock and on forage crops. In fact, it has an unusual range of effectiveness.

And third, "Marlate" is both quick-acting and long-lasting. It knocks down many insects on the wing, and for many uses, one application remains effective for several weeks.

* * *

"Marlate" is one of many outstanding products of Du Pont research. You can get full information on Du Pont chemicals for the farm from your Du Pont technical service representative. Or write to Du Pont, Grasselli Chemicals Department, Wilmington 98, Delaware.

DU PONT CHEMICALS FOR THE FARM INCLUDE:

Fungicides: PARZATE® (Liquid and Dry), FERMATE®, ZERLATE®, Copper-A (Fixed Copper), SULFORON® and SULFORON®-X Wettable Sulfurs—*Insecticides:* DEENATE® DDT, MARLATE® (Methoxychlor), LEXONE® (Benzene Hexachloride), KRENITE® Dinitro Spray—*Weed Killers:* AMMATE®, 2,4-D, TCA and Dinitro Weed Killers—*Also:* Du Pont Cotton Dusts, Du Pont Spreader Sticker, PARMONE® Fruit Drop Inhibitor and many others.

®REG. U. S. PAT. OFF.

[On all chemicals always follow directions for application. Where warning or caution statements on use of the product are given, read them carefully.]

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

A NEW AND RELIABLE SOURCE OF SUPPLY OF AMMONIUM SULFATE

The new Phillips Chemical Company plant at Port Adams, Texas, is capable of producing more than 700 tons of Ammonium Sulfate per day. Ample quantities of Anhydrous Ammonia are assured by a dependable supply from our other great plant located at Etter, Texas.

Phillips 66

Phillips 66 Ammonium Sulfate is an essentially pure fertilizer product, suitable for high analysis mixtures, or for direct application. It is characterized by uniform crystals and the ability to resist caking. Available NOW in bags or bulk. Write or wire for full information.

Phillips Chemical Company

FERTILIZER SALES DIVISION • BARTLESVILLE, OKLAHOMA

Fertilizer News

ACS Fertilizer Division in September Meeting

THE tentative program for the meeting of the Division of Fertilizer Chemistry of the American Chemical Society has been announced. The meeting will be held at Atlantic City, N. J., September 19–21, inclusively.

Dr. Jackson B. Hester is chairman of the group, and Dr. Vincent Sauchelli is secretary. Dr. Sauchelli will preside at the Monday afternoon and Tuesday morning sessions, and Dr. Hester will be in charge of the meetings scheduled for Tuesday afternoon and Wednesday morning.

Among the names of speakers and their subjects appearing on the advance program are C. L. W. Swanson, "Field Experiments with Fertilizers in Japan"; J. O. Hardesty and Rikio Kumagai, "Some Properties of Fertilizer Conditioning Agents"; H. E. Evans, E. R. Purvis and F. E. Bear, "The Molybdenum Content of Some Common Fertilizer Materials"; and A. A. Nikitin, "Value of Visible Symptoms of Trace Element Deficiencies in Plant Growth".

R. W. Ruprecht is to speak on "Should Trace Elements be Added to Commercial Mixed Fertilizers?"; Jackson B. Hester, "Mineral Elements and Nitrogen in Manure versus Manure"; W. H. MacIntire, S. H. Winterberg, A. J. Sterges and L. B. Clements, "Fertilizer Evaluation of Mono- and Di-Ammonium Phosphates by Means of Pot Cultures."

A discussion of the role of sulfur in agriculture will be held on Tuesday morning. W. W. Duecker, Texas Gulf Sulfur Co., New York, will introduce the subject, followed by R. L. Starkey with a paper, "Relations of Microorganisms to Transformations of Sulfur in Soils."

B. R. Bertramson, Maurice Field, and S. L. Tisdale will discuss "Sulfur Status of Indiana Soils"; D. G. Aldrich and F. A. Gunther, "The Effect of Soil Acidification on Some Chemical Properties of a Soil and Plants Grown Thereon"; M. D. Thomas, Russell H. Hendricks and George R. Hill, "Sulfur Metabolism in Alfalfa."

A. B. Groves will discuss "Sulfur Fungicides in Fruit Production"; John P. Conrad, "Sulfur Fertilization in California and some Related Factors"; Vincent Sauchelli, "Sulfur in the American Fertilizer Industry"; A. L. Mehring and G. A. Bennett, "Sulfur in Fertilizers, Soil Amendments and Manures."

Wednesday morning will see another general session, opening with a paper by Messrs. MacIntire, Winterberg, L. J. Hardin, Sterges and Clements, "Fertilizer Evaluation of Certain Phosphorus Materials." Following will be a progress report by Dr. J. W. Turrentine, "Potash Production"; a paper by W. B. Andrews and Marvin Geiger, "The Problems and Chemistry of Direct Application of Anhydrous Ammonia to the Soil"; another by K. G. Clark, J. Y. Yee, K. S. Love and T. A. Boyd, "Further Observations on the Preparation and Properties of Urea-Form."

The final two papers on the program are as follows: "Cyanamid and Related Compounds in Agriculture", by Frank L. Stark, Jr. and Delmar S. Fink; and a report on the non-farm use of fertilizers in the United States in 1947–48, by Walter Scholl and Hilda M. Wallace.

•

Control Officials Program

A tentative program for the Association of American Fertilizer Control Officials has been announced by the group. Among those scheduled to speak at the meeting, to be held October 7 at the Shoreham Hotel, Washington, D. C., are Dr. B. D. Cloaninger, president of the A.A.F.C.A.; Dr. Russell Coleman, president of the National Fertilizer Association, Washington; Clifton A. Woodrum, president of the American Plant Food Council, Washington; and J. B. Douthit, Pendleton, S. Carolina. Mr. Douthit will speak on "Farm planning for more efficient use of fertilizers."

"Fertilizer Usage in Canada" will be discussed by G. W. Michael, Ottawa, Ontario, Canada, and the fertilizer outlook for the U.S. in 1950 will be discussed, probably by a representative of the U. S. Department of Agriculture. Dr. A. L. Mehring, U.S.D.A., Beltsville, Md., will present a paper on fertilizer grades and higher analysis.

"Regulatory Chemistry in Citrus Production" will be discussed by Allen B. Lemmon, former A.A.F.C.A. president, Sacramento, California. There will also be reports of investigators; of special committees; and a report on the model State fertilizer bill. Dr. H. A. Halvorson, St. Paul, Minn. will present the report of the States Relation Committee at the meeting.

An election of officers will precede adjournment of the day's session, according to the advance program. The morning session is scheduled to begin at 8:30 and the afternoon meeting at 2:15.

•

NFA Plans Fall Meeting

The National Fertilizer Association will hold its annual fall meeting at the Atlanta Biltmore Hotel, Atlanta, Ga., November 14, 15 and 16. Association secretary Daniel S. Murph states that the first day will be occupied with registration, a meeting of the board of directors and with various committee meetings. The following two days will comprise the meeting proper, he said.

Details of the program were being worked out at press time, but no announcement had been made of speakers' names or the topics of their talks.

IMPROVE THE EFFICIENCY OF YOUR INSECTICIDES AND FUNGICIDES WITH . . .

TRADE VATSOL MARK

WETTING AGENTS

Each different type of VATSOL Wetting Agent has been developed for a specific purpose in insecticides and fungicides. You will improve the efficiency of your products by investigating the VATSOLS and using the type which best meets your particular needs.

VATSOL K Powder

A dry powdered wetting agent, containing 33⅓ of VATSOL OT 100% in an inert filler. It is neutral in reaction and compatible with most of the common insecticides used in the form of wettable powders. Ready "flowability" recommends it for blending with dry insecticides or fungicides which are to be applied in the spray form. It may also be added to the spray tank containing any insecticide or fungicide. Because of its non-hygroscopic nature, VATSOL K can be readily repacked into small containers for local distribution.

VATSOL OT 100% Pellets

In pellet form this grade resembles paraffine, is somewhat soft and plastic and non-hygroscopic. Its solubility in petroleum and vegetable oils and absence of water makes this the preferred grade for oil sprays and other liquid concentrates where water is an undesirable component. Although not an emulsifying agent, VATSOL OT is a desirable additive material when used with an emulsifier in preparing a miscible, fast-breaking, mineral oil stock.

VATSOL OT 85% Paste

A heavy, viscous paste composed of 85% VATSOL OT 100% and 15% water. This is excellent for use in preparing miscible oils and fruit and vegetable washes.

VATSOL OT 70% Liquid

Contains 70% VATSOL OT 100% plus a neutral solvent and water. Because of its fluidity and ready solubility in organic solvents it is especially useful in concentrated liquid insecticides. This grade is not intended for use as a vegetable washing agent but is excellent for bulb dips.

VATSOL OT 25% Aqueous

Contains 25% VATSOL OT 100% and 75% water. This grade may be added directly to the spray tank or reduced to 10% strength and added to spray or wash solutions. Ideal for washing fruits and vegetables or for spraying with insecticides such as lead arsenate or nicotine sulfate.

Further information on use and cost will be promptly furnished upon request.

AMERICAN Cyanamid COMPANY

Agricultural Chemicals Division

32-D Rockefeller Plaza, New York 20, N. Y.

Calif. Fertilizer Ass'n Meets

The California Fertilizer Association's 25th anniversary meeting will be held at the Mission Inn, Riverside, Calif., October 18 and 19, 1949. According to Dr. Oliver E. Overseth, executive secretary of the group, speakers at the opening session Monday morning, will include Allen B. Lemmon, Chief, Bureau of Chemistry, Sacramento, Calif.; W. E. Martin, Extension specialist in soils, Berkeley, Calif.; and E. F. Wallihan, University of California Citrus Experiment Station, Riverside. His topic will be on radioactive phosphorus as a tool in plant nutrition research. Oscar A. Lorenz, Prof. of Truck Crops, University of California, Davis, will present a preliminary report on fertilizer placement work.

Tuesday morning's session will open with an address of welcome by Dr. L. D. Batchelor, director, Riverside Experiment Station. Paul Pauly, Pacific Guano Co., Los Angeles, will read the minutes of the 24th annual meeting; and Wallace MacFarlane, also of Pacific Guano Co., and president of the California Fertilizer Association, will review his twenty-five years in agriculture in California.

C. B. Moore, secretary and managing director of the Western Growers Association, will discuss "Quantity and Quality Production Essentials to Western Row Crops"; and F. R. Wilcox, Assistant General Manager, California Fruit Growers Exchange, will discuss problems related to the citrus industry in the way of quality and quantity production.

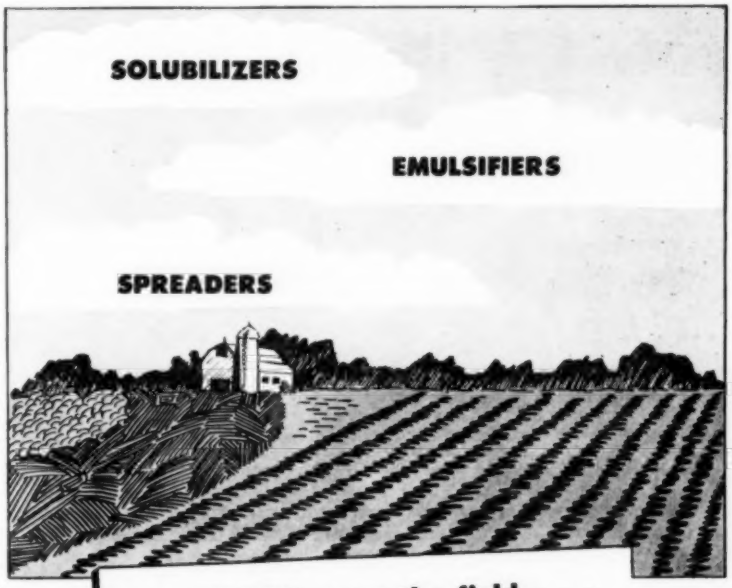
Hans Jenny, professor of soil chemistry, University of California, will present data on the fertility levels of California soils as indicated by pot tests, to complete the morning's agenda.

Tuesday afternoon will see a continuation of the sessions, with A. D. Shamel, Riverside, Calif., looking back on fifty years of observation on fertilizer practices. C. T. Prindeville, Swift & Co., Chicago, will speak briefly, followed by M. E. McCollam, American Potash Institute.

Another guest speaker to appear on Tuesday afternoon, is George D. Scarseth, director of research, American Farm Research Association, Lafayette, Ind. Mr. Scarseth has announced his topic as being "Fertilizers, Food, Fun, Freedom and the Future." He will be followed by Dr. Overseth who will present his annual report to the convention. The annual business meeting will terminate the day's activities.

NFA Film Televised

The National Fertilizer Association, Washington, reports that its film, "Hunger Signs in Crops", was televised over station WHIO-TV, Dayton, Ohio, on August 9. This event was thought to be the first time a commercial fertilizer film had been presented to a television audience.



the EMCOLS cover the field . . .

EMCOL H-30 — *For Emulsifiable Concentrates of Aromatic Solvents*

EMCOL H-47 — *Similar to EMCOL H-30 with different specifications*

EMCOL H-50 A — *For Emulsifiable Concentrates of Kerosenes*

EMCOL H-65 A — *Solubilizer for Chlordane*

EMCOL H-72 — *Emulsifier for 50% Chlordane in Kerosenes*

EMCOL H-74 — *Emulsifier for HIGH POTENCY Chlordane or Toxaphene in Concentrates*

EMCOL X-25 — *100% Anionic Soapless Insecticide Wetting and Spreading Agent*

Developed Particularly for the Critical Formulator by

THE EMULSOL CORPORATION

59 E. Madison St. Chicago 10, Illinois

Emulsol

A QUARTER CENTURY OF SURFACE ACTIVE CHEMISTRY

Send for Information

Wisconsin Symposia Held

Two symposia on mineral nutrition were to be held at the University of Wisconsin, September 1 to 7. The first, occupying the initial three days, was to be devoted to mineral nutrition of plants and the second, running from Sept. 5 through 7, was to include discussions on plant growth substances.

Members of the University of Wisconsin agricultural staff were to appear on the program, as was Dr. E. B. Fred, president of the University. Other speakers were to include Dr. Damon Boynton, Cornell University; Jackson Hester, Campbell Soup Co.; Drs. H. C. Hoagland, Hans Jenny and T. C. Broyer, University of California; Drs. Russell Coleman and Malcolm McVickar, president and chief agronomist, respectively, of the National Fertilizer Association, Washington, D. C.; Dr. Firmen E. Bear, Rutgers University; A. C. Orvedal, D. E. Kellogg, Lyman A. Dean, Roy Overstreet, R. A. Steinberg, and Thomas Kerr, U. S. Department of Agriculture; P. W. Zimmerman, Boyce Thompson Institute, Yonkers, N. Y.; and E. L. Tatum, Stanford University, Palo Alto, California.

Industry members were invited to attend the sessions, and a heavy registration was anticipated.

•

Application Committee to Meet

Preceding the meeting of the American Society of Agronomy at Milwaukee, Wisconsin, the National Joint Committee on Fertilizer Application will convene in a one-day session on October 24. Some 14 papers on fertilizer application will be presented, according to the advance plan. These papers will discuss both the specific and technical aspects of application. Following the presentation of each paper, there will be a period of discussion.

On the Committee are representatives of American Society of Agronomy, the National Fertilizer Association, the American Society of Agricultural Engineers, the American Society for Horticultural Science, the Farm Equipment Institute and the National Canners' Association.

Meetings of the American Society of Agronomy are scheduled to begin on October 25 and will continue through the 28th.

•

Royster Suffers Fire Loss

Fire destroyed a section of the factory building of the F. S. Royster Guano Co. at Baltimore, Md., on August 2. The plant, located on the waterfront, was only partially damaged, with the blaze being confined to one building.

•

New Plant for Iceland

The Parliament of Iceland has recently authorized construction and operation of a fertilizer plant which is expected to cost some $6,900,000. Production capacity will be between 5,000 to 10,000 metric tons annually, it is reported.

TEEJET SPRAY NOZZLES FOR WEED KILLING

Chemical Manufacturer

"We've liked TEEJETS since the early days of research in weed killing. It takes the uniform distribution of a TEEJET nozzle to make a chemical really effective at the least cost per acre."

TEEJET SPRAY NOZZLES FOR WEED KILLING

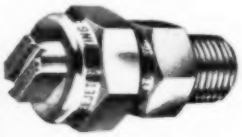
Equipment Manufacturer

"No matter how good we build a spray rig . . . it's only efficient in proportion to its nozzles. We like TEEJETS because they hit rated capacity right on the nose every time."

TEEJET SPRAY NOZZLES FOR WEED KILLING

Farmer

"I've used a lot of different spray nozzles in the last year. It took TEEJETS on my rig to give me the perfect distribution that's essential for real weed killing. More than that, my spray mixture went farther."



SELECT

SPRAYING SYSTEMS

TeeJet SPRAY NOZZLES

- Interchangeable Tips for all capacities
- Precision built with Monel metal strainers
- For WEED KILLING and all other farm spraying needs.

SPRAYING SYSTEMS CO.

3230 RANDOLPH ST., BELLWOOD, ILLINOIS

SUBURB OF CHICAGO

TEEJET SPRAY NOZZLES FOR WEED KILLING

Phillips Appoints Wright Mgr.

Phillips Chemical Co., Bartlesville, Oklahoma, has announced the appointment of L. H. Wright as

L. H. Wright

manager of the Fertilizer Sales Division at Bartlesville. Mr. Wright is a graduate of Purdue University with a B.S. degree in chemical engineering. He has been with Phillips Petroleum Co. since 1930, and since 1946 has been assistant manager of the Philgas sales group.

The company also announced a number of new appointments in the firm's Fertilizer Sales Division.

A. W. Peck

R. D. Evans

C. J. Ball

R. D. Evans is now manager of the Houston district of the fertilizer division; A. Wayne Peck is a sales representative in the anhydrous ammonia section; Clarence J. Ball is manager of the Norfolk, Va., district; Kasper Peter is manager of the Chicago district; and Harold R. Krueger is director of technical service for the fertilizer sales div.

Mr. Evans is a native of Texas and a graduate of Texas A. & M. College. He was later an assistant county agent in Texas, and spent five years in the army. Three and a half years of this time he was a Japanese prisoner. Since the war, he has directed veteran on-the-farm training in Louisiana, and was for a time agricultural agent for the Katy railroad. He will handle sales distribution of "Phil-

DDT

2,4-D

Acid, Salt and Isopropyl Ester

AVAILABLE FOR PROMPT SHIPMENT

EXCLUSIVE SALES AGENTS FOR

MONTROSE CHEMICAL CO.

120 LISTER AVENUE NEWARK 5, N. J.

R. W. GREEFF & CO., INC.

lips 66" ammonium sulfate, ammonium nitrate, nitrogen solutions and anhydrous ammonia.

Mr. Peck joined Phillips in the research and development department in 1939, but two years later became a civilian instructor in carburetion and supercharging equipment at Amarillo Army Air Field. Since the war he has been a manufacturers agent in the liquefied petroleum gas marketing and equipment field.

Mr. Ball, a native of Georgia, has had 29 years of service in the chemical and fertilizer field. From 1920 to 1935, he was with International Minerals and Chemical Corporation, and was later with Allied Chemical and Dye Corp., serving as southern sales manager. His headquarters for Phillips will be in the Royster Building in Norfolk, Va.

Mr. Peter is a native of Germany, and a graduate of the University of Munich in 1923. Upon arrival in the U.S. a year later, he worked in the bureau of dairying of the U.S.D.A. at the University of Wisconsin. He was connected with midwestern fertilizer sales for Synthetic Nitrogen Products Corp. for four years and with American Cyanamid Corp. for 17 years before joining Phillips. His office in Chicago is at 7 So. Dearborn St.

Mr. Krueger has had 25 years of experience in the manufacture and sale of chemical fertilizers. He is a native of Pittsburgh, and a graduate of the University of Florida. Before joining Phillips, Mr. Krueger was associated with the American Agricultural Chemical Co.; Atlantic and Gulf Fertilizer Co.; Howard Fertilizer Works; and International Minerals & Chemical Corp. His headquarters will be in Bartlesville, Oklahoma.

•

Fertilizer Plant is Described

The July issue of *Chemical Engineering* carries an article by R. W. Moulton describing a process of manufacturing calcium-magnesium-phosphate fertilizer by the electric furnace method. Diagrams are presented picturing the Manganese Products, Inc., plant in Seattle, and a complete description is given of the process. The article states that the electric furnace process is practical where power is cheap and where olivine and phosphate rock are plentiful.

Fused phosphate fertilizer, manufactured by this method is described as being gray, granular, dense, odorless, free-flowing, non-hygroscopic, non-caking and non-corrosive. The material does not rot bags of any type, and, unlike superphosphate, it requires no curing period and is non-acid in reaction. In fact, the high soil-sweetening value of calcium magnesium phosphate makes it particularly suitable for use on acid soils. Response of plants to the product has been satisfactory, the article reports, and the material is growing in favor with farmers in the northwest.

SEE STAUFFER

Stauffer CHEMICALS SINCE 1885

FOR THESE AGRICULTURAL CHEMICALS

SULPHURS
Spraying—Dusting—Soil
Refined—Mixtures

DDT
Technical and Concentrates

BHC
Technical and Concentrates

TOXAPHENE
Wettable and Dust Concentrates

341-C
An oil summer fungicide
for apple scab

PARATHION
Wettable and Dust Concentrates

CHLORDANE
Wettable, Emulsifiable and Dust Concentrates

2,4-D
Amine and Ester Concentrates

CALCIUM ARSENATE
CRYOLITE BORAX

Stauffer CHEMICAL COMPANY
420 Lexington Ave., New York 17, N. Y.
636 California Street, San Francisco 8, Cal.
221 No. LaSalle Street, Chicago 1, Illinois
555 So. Flower St., Los Angeles 13, Cal.
Apopka, Fla. • Houston 2, Tex. • Weslaco, Tex.

U.S.D.A. Fertilizer Tour

Some 100 persons were guests of the U. S. Department of Agriculture on a tour of fertilization plots near the Plant Industry Station near Beltsville, Md., on August 5. Dean T. B. Symons of the University of Maryland gave a welcoming address, Dr. Frank Parker, U.S.D.A., discussed the plant nutrient resources (NPK) in the U.S., and Dr. R. I. Parks spoke on soil management to obtain more yield per acre of land. The group inspected the station's soilless plant culture, looked at stands of grasses for turf and golf greens, observed orchard fertilization with high-nitrogen mulch, and crops showing the effects of applications of insecticides.

•

Co-op Marks High Production

Southern States Cooperative, Richmond, Va., expects to produce its two-millionth ton of fertilizer before Oct. 31, at one of its three fertilizer manufacturing plants. This amount has been made since this co-operative began producing in 1926.

Meanwhile at the fertilizer plants, 100 certificates were placed in bags of fertilizer, to be redeemed for $5 in cash to the finders. One certificate also entitles the finder to the 2,000,000th ton of fertilizer. When this ton is actually produced it will be set aside and held until the special premium certificate is presented at the Richmond headquarters. Special attention-getting bags have been designed for this 2,000,000th ton and suitable public ceremonies will mark the presentation.

•

Mulhern to California

Thomas D. Mulhern, department of entomology, Rutgers University, New Brunswick, N. J., has accepted a position with the California State Department of Public Health, Berkeley. Mr. Mulhern has been secretary of the New Jersey Mosquito Control Association for a number of years, and has been associated with the Agricultural Experiment Station at Rutgers since 1928. His work in mosquito control has attracted national recognition.

His new work will be located in the San Joaquin valley where he will be in charge of control work against mosquitoes, ticks and rodents which transmit diseases. He has been given a year's leave of absence from Rutgers, the school has announced.

Am. Potash Reports

American Potash & Chemical Corporation reports net income for the three months ended June 30, 1949 as $406,319 or 64 cents per share on the Class A and B stocks, compared with $391,412 or 61 cents per share for the three months ended March 31.

Sales for the three months ended June 30, 1949 were $3,074,496, compared with $3,530,642 for the first quarter of 1949.

YOUR *Check list*

of properties required by a good carrier for wettable dust concentrates

☑ **WETTABILITY** — CONTINENTAL CLAY wets as readily as *any carrier tested* in the Vanderbilt Laboratory.

☑ **COMPATIBILITY** — CONTINENTAL CLAY is safe to use with all types of toxicants in typical wettable concentrates.

☑ **DISPERSIBILITY** — CONTINENTAL CLAY gives finely dispersed suspensions completely free from agglomerates.

☑ **PARTICLE SIZE** — CONTINENTAL CLAY has a specification of less than 0.75% retained on a 200 mesh screen, and an average particle size of 0.15 micron by sedimentation.

☑ **PLENTIFUL SUPPLY** — CONTINENTAL CLAY is *always* available.

Test and Compare. Comparison Will Prove the All-Around Superiority of Continental Clay. Write for Sample and Further Information.

AIDS FOR AGRICULTURE

Pyrophyllite—PYRAX ABB

Clays—CHEROKEE, CONTINENTAL

Dispersing Agents—DARVAN #1, DARVAN #2

Suspending Agent, Spreading and Sticking Agent } VEEGUM

R. T. VANDERBILT CO., Inc.

SPECIALTIES DEPARTMENT

230 PARK AVE., NEW YORK 17, N.Y.

Pacific Exposition for Nov.

A report on "Agricultural Chemicals—A Ten Year Review," is scheduled for presentation at a group conference of agricultural and food chemists to be held in conjunction with the Pacific Chemical Exposition in San Francisco's Civic Auditorium, Nov. 1 through 5. Other talks and panel discussions under eleven separate scientific groupings are also on the conference program during the affair.

More than 100 commercial exhibitors of chemicals and chemical equipment will display and demonstrate new developments in chemistry, and there will also be a group of special exhibits of U. S. Dept. of Agriculture work, an "Animal Circus" of laboratory animals, continuous showing of industrial films and other features during the five day show.

The exposition is sponsored by the California section of the American Chemical Society, with cooperation from allied scientific and trade groups. Its primary purpose is to stimulate interest in industrial chemistry throughout the eleven western states, Alaska, South America, the Orient and Australia.

•

Study Potato Fertilization

In a study of fertilizers on potatoes the New Hampshire Agricultural Experiment Station, Durham, reports that "If the potassium in the fertilizer mixture is supplied in the form of potassium sulfate, the potatoes are of superior quality as compared to those fertilized with a mixture in which the potassium is supplied as potassium chloride." It appears, continues the report, "that the differences are sufficiently great so that some of the newer, disease resistant varieties of only fair cooking quality, by fertilization with potassium sulfate, may be improved sufficiently in quality to permit its adoption by the commercial grower without sacrificing quality."

•

N. J. Fertilizer Meeting

More than 100 fertilizer manufacturers and dealers are expected to attend the annual fertilizer conference at the College of Agriculture, Rutgers University, New Brunswick, New Jersey, on Sept. 29.

Among speakers will be Dr. Russell Coleman, president of the National Fertilizer Association, Washington, D. C., whose topic will be "The Role of Fertilizer in the Permanent Agricultural Program." Dr. Graham Campbell, Cranbury, N. J. will speak on "Fitting the Fertilizer to the Farm."

Dr. William H. Martin, dean of the Rutgers College of Agriculture and director of the Agricultural Experiment Station, will open the conference and preside. Topics will be presented by Dr. Firman E. Bear, Dr. E. R. Purvis and Harold Evans, all of the college's Soils Department. Dr. Stacy B.

COPPER SULPHATE

Crystals
Superfine
Powdered

•

Basic
Copper Sulphate

•

Natural Basic Zinc

55% Zinc as metallic

The High Test Nutritional Zinc

Agricultural Sales Agents

W. R. E. ANDREWS SALES CO.

1505 Race Street, Philadelphia 2, Pa.

Since 1926

Agricultural Chemicals Specialists

Randle, research specialist in chemistry of the college, will speak on "What the Fertilizer Law Requires."

•

Insecticide Appropriation OK

An appropriation of $1,750,000 for control of emergency outbreaks of insects and plant diseases was approved by Congress on August 3, and was sent to the White House for final endorsement. The measure, HJ Resolution 327, was approved by Senate-House conferees on Aug. 3, and was adopted by both houses.

The amount appropriated is a compromise between the $3,500,000 asked by the Bureau of the Budget, and the $1,500,000 originally provided by the House Appropriations Committee.

•

S. Carolina Cotton Conference

Included on the program of the third annual Beltwide Cotton Mechanization Conference, held at Bennettsville, S. C., Aug. 17–19, were talks on fertilizer placement, chemical weed control, and pest control. Dr. W. L. Nelson, agronomist, North Carolina State College, discussed "Planting and Fertilizer Placement"; Dr. K. S. Quisenberry, head, Division of Cereal Crops and Diseases, U.S.D.A. Bureau of Plant Industry, described the needs and accomplishments in chemical weed control research by the U.S.D.A. S. L. Calhoun, entomologist of the Bureau of Entomology and Plant Quarantine, U.S.D.A., talked on "Application of Insecticides and Defoliants."

In a summary discussion on the final day, Dr. H. P. Cooper, director of the South Carolina Agricultural Experiment Station, talked on the general subject of soil fertility, applying his remarks specifically to cotton growing.

The theme of the conference was "Tooling for the South's new pattern of Agriculture." The event was sponsored by the National Cotton Council of America, in cooperation with land grant colleges, the Farm Equipment Institute, and the U. S. Dept. of Agriculture.

Tolerance Hearings in 1950

Hearings will be opened in Washington early in 1950, as one of the initial steps in setting up residue tolerance standards for agricultural insecticides, according to Dr. Paul B. Dunbar, Commissioner of the Food and Drug Administration. Dr. Dunbar stated that he hopes to get hearings under way some time in January, but the definite date was not set.

The hearings will cover a wide range of insecticidal materials, including the fluorides and lead arsenate insecticides as well as many of the newer ones, including DDT, methoxychlor, parathion, etc.

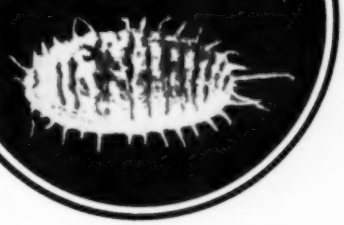
Spokesmen for the industry have indicated that a "scientific" investigation of the subject would be welcomed by the manufacturers, in order to eliminate some of the confusion and conflicting statements concerning toxicity and residues.

INVESTIGATE ESTON'S NEW INSECTICIDE

ALKRON®

(Parathion)

FOR CONTROL OF MEALYBUGS



Effective Against

APHIDS
RED SPIDERS
PSYLLA
BEAN BEETLES
THRIPS
BUD MOTHS
MEALY BUGS

Eston ALKRON, the amazing new residual insecticide, is effective against both chewing and sucking insects and mites, including red spiders, bean beetles, aphids, psylla, thrips, mealy bugs and bud moths. ALKRON is available as a dust or spray powder in a wide range of standard packages. Eston is a basic producer of phosphate insecticides. Learn about this remarkable new organic phosphate material by sending in Coupon below.

ESTON INSECTICIDES

CLIP and MAIL

ESTON CHEMICALS, *Inc.*
3100 E. 26th St., Los Angeles 23, Calif.

Without obligation, please send me the Eston ALKRON (Parathion Insecticide) descriptive material.

NAME _____

ADDRESS _____

CITY & ZONE _____

Breaks Production Record

H. D. Hudson Co., Chicago, has reported that its plant at Hastings, Minn. recently produced 25,000 compression sprayers in twenty working days, to fill an order for the U. S. Army Engineer Corps. The sprayers were made from a standard pattern in the Hudson line, this particular model being known to the trade as the "Leader". Hudson officials state that the record-breaking run on compression sprayers was handled at the same time the factory was turning out other sprayers and dusters for regular trade channels.

•

Berndt, Sprout-Waldron, Dies

Irving A. Berndt, vice-president and controller of Sprout, Waldron & Co., Muncy, Pa., died on June 30. He had been with the company for many years, and was well-known in the milling and grinding field for which his company manufactures equipment.

•

Put MORE dust on—
KEEP more on... use

CP-5

DUST STICKER
• not a diluent •

Applications of dusts formulated with CP-5 dust sticker now total millions of pounds. CP-5 dust sticker gives maximum initial deposits and highest retention. All agricultural dusts need CP-5 dust sticker.

Dry, Free Flowing Powder

CP-5 is an economical powder for incorporation with dusts for increased effectiveness. Write today for latest test results and samples.

COLLOIDAL PRODUCTS
SINCE CORPORATION 1920
SAN FRANCISCO 11, CALIFORNIA
Spreaders - Deposit Builders - Stickers for Agricultural Sprays and Dusts

AIRPLANES

(*Continued from page 28*)

ably and thus make the downdraft more significant. This downward movement of air reaches its maximum in slow-moving helicopters.

Huge expenditures have been made to learn what happens to the air surrounding aircraft in flight—to determine its effect upon the aircraft. Little has been done to measure the movement of air behind and below an airplane. The use of wind tunnels, although of particular value in studying spraying devices, would not be helpful for this purpose, because the forced draft of air behind the aircraft in a tunnel is not comparable to the air behind an airplane in flight. This subject is of special interest to custom sprayers. Fortunately its importance is beginning to be realized.

Aircraft operators are to be highly commended for their efforts to improve aircraft spraying. The shortage of facilities for checking their results, however, has limited progress, and the lack of detailed published information about what has already been achieved is another decided handicap. Real progress is being made, nevertheless, by custom operators and public agencies, and interest in this method of pest control is growing rapidly. Records of the Civil Aeronautics Administration show that in May 1946, the ratio of aircraft operators engaged in dusting to those engaged in spraying was 15 to 1. The ratio was 1 to 1 just 2½ years later.

•

Plans Egyptian DDT Plant

Plans for the erection of a DDT plant in the vicinity of Cairo, Egypt, have been announced by H. E. Mamdouh Riad Bey, Minister of Commerce and Industry of Egypt. Details of the plant were lacking, but it was indicated that 50 percent of the capital would be provided by

Egypt's Industrial Credit Bank and the public; 45 percent by Egyptian manufacturers of chemicals, and 5 percent by American investors.

The agreement also provides that the Egyptian government guarantee a dividend of 5 percent on the paid-up capital, that the cost of the plant's establishment be amortized in five years at the rate of 20 percent per year, and that the Government grant tariff protection against foreign competition.

FUNGICIDES

(Continued from page 19)

no choice at present but to continue the laborious constant protective spraying.

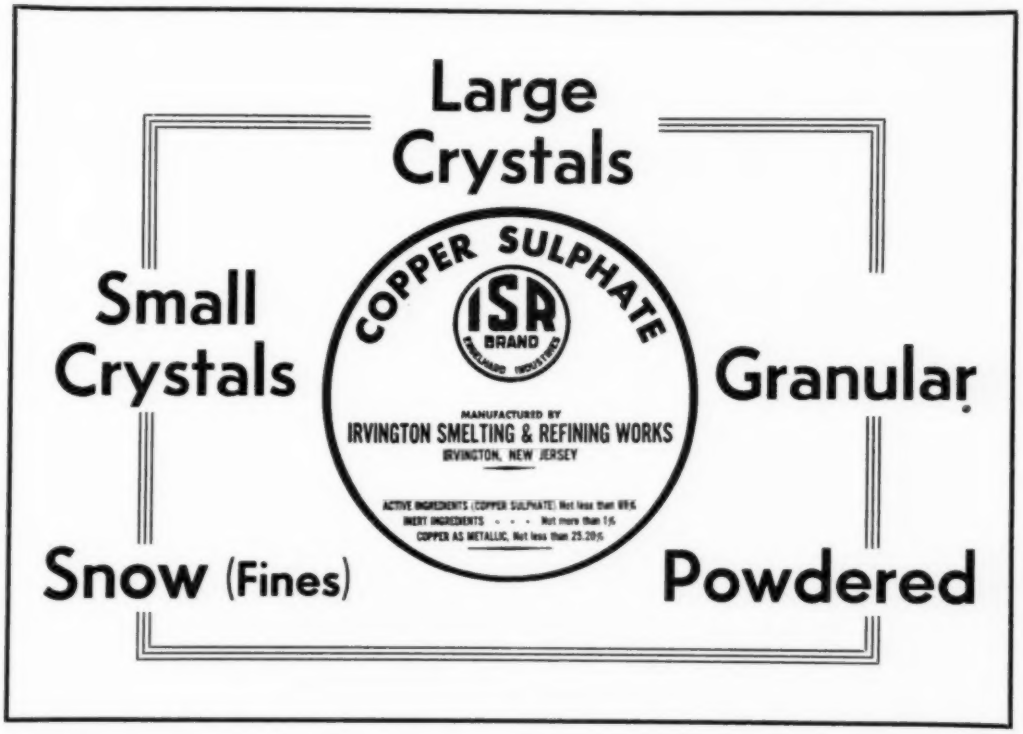
Where other diseases are present, supplementary applications of fungicides must be made to fit the circumstances. Applications of dithiocarbamates recommended for early season use where apple rust is a problem, should follow the mercury eradicants, since leaf injury and fruit abscission have been observed where the mercury compounds were used after dithiocarbamates. Where apple blotch or bitter rot is present each season, special applications of copper or dithiocarbamate will have to be introduced at the time needed. Where sooty blotch is common, an application of sulfur, copper, or dithiocarbamate one month before the general harvest is indicated. None of these diseases appears to be controlled by the application of the mercury compounds early in the season.

The mercury compounds are poisonous to animals and are not recommended for use on apple fruit after the time of the first cover spray. At this time the young fruits are very small and do not retain any significant quantity of residue. Care should be exercised in handling the mercury concentrates, since they are corrosive to the mucous membranes. If, by accident, these materials are deposited on the exposed parts of the body, drenching with water is indicated since the diluted material is not injurious.

Peach Disease Control

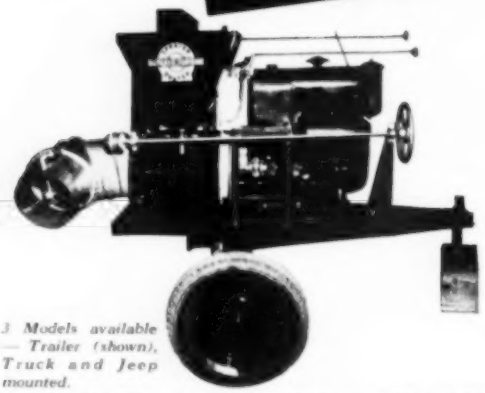
CURTIS L. MASON, of the University of Arkansas, reports favorable results from the use of sodium hypochlorite as a spray for peach disease control. This material in commercial solution is well known as a household and dairy disinfectant and as a clothing bleach; and in the laboratory for surface sterilization of material before culturing.

Recent work in Michigan has indicated that a dilute solution of chlorine water was effective in reducing the amount of storage rot of peaches dipped in the solution. Since no damage to the fruit was reported, it was considered likely that no damage would result from using similar solutions on a dormant tree. Accordingly, sodium hypochlorite was included in a series of treatments applied to Elberta peach trees in the delayed



THE BEST METHOD FOR USING MODERN CONCENTRATES

THE BUFFALO TURBINE MIST SPRAYER-DUSTER



3 Models available — Trailer (shown), Truck and Jeep mounted.

CUT SPRAYING — DUSTING TIME — SAVE LABOR

Greater air force and turbulence created by Buffalo Turbine's exclusive axial flow blower atomizes concentrates into a fine, swirling mist which quickly and thoroughly blankets large areas. Air, not liquid, is the carrier.

Orchardists completely cover over 20 acres of mature fruit trees per hour; row crop growers report complete coverage at 20 acres per hour and weed control at over 40 acres per hour—getting nearly 100% kill on each pass. City and County Parks Departments and resort owners report exceptional speed, thoroughness and economy in insect pest control.

Dwarf spraying. Covers tallest trees completely in one pass.

FEATURES

1. Uses all standard concentrates, sprays, dusts singly or in combination.
2. Range is up to 200 feet horizontally—125 feet vertically.
3. Light weight—uses only 10% of water required by conventional rigs—less weight.
4. Nozzle Velocity controlled by engine speed.
5. Spray and dust density is easily controlled.
6. Round and fish-tail air nozzles are standard equipment.

Write for illustrated bulletin 9-AC

BUFFALO TURBINE
AGRICULTURAL EQUIPMENT COMPANY, INC.
SOWANDA, NEW YORK

THE HEART OF THE BUFFALO TURBINE MIST SPRAYER DUSTER IS THE AXIAL FLOW BLOWER

QUALITY

INSECTICIDE MATERIALS

prompt and efficient service to dust blenders and mixers

DDT BHC Toxaphene Sulphur Diluents

ASHCRAFT-WILKINSON CO.

ATLANTA, GA. AND BRANCHES

COMPLETE WEST COAST CHEMICAL SERVICE

Warehousing

Custom Grinding
(micro-fine)

Complete 2,4-D Processing Equipment

Grinding and Packaging of Powders
(carloads to ounces)

Mixing and Filling of Liquids
(tank cars to pints)

•

HECKATHORN & CO., LTD.

FOURTH & CUTTING BLVD.
P.O. BOX 1407
RICHMOND, CALIFORNIA

dormant stage for the control of bacterial spot (caused by *Xanthomonas pruni*). Sixteen trees in a commercial orchard near Nashville, Arkansas, were sprayed on March 1, 1949, when the temperature was about 40° F. One gallon of commercial sodium hypochlorite containing 5 1-4 percent of active ingredient ("Clorox" was used) was added to 100 gallons of water and the trees were sprayed thoroughly. A disease count taken on April 19 showed an average of 8 percent bacterial spot leaf infection on the trees sprayed with this solution; whereas 16 unsprayed in the same block averaged 17 percent leaf infection.

On May 12, five Elberta trees with normal foliage were sprayed with a sodium hypochlorite solution of the same concentration to determine toxicity to peach leaves. Since no adverse effect was noticeable by May 14, 200 Elberta trees in a commercial orchard were sprayed with the material at the same concentration. No injury was observed by May 20, and the trees were then sprayed with a solution containing 2 gallons of commercial sodium hypochlorite per 100 gallons of water. No damage was evident by May 27, and another application of the same strength solution was made. All of the trees in this orchard had a rather heavy incidence of bacterial spot on the foliage but very little on the fruit. The leaves continued to fall following the three applications, but not so heavily as in the remainder of the block that had received the regular applications of zinc-sulfate and lime.

Rainfall was heavy through early June, and by June 15 brown rot of the fruit (caused by the fungus *Monilinia fructicola*) in a block of Fair's Beauty peaches adjacent to the Elbertas was becoming an increasing problem owing to numerous growth cracks. This block of approximately 20 acres was sprayed with a solution of 2 gallons of commercial sodium hypochlorite per 100 gallons to test its effectiveness for brown rot control. Although weather conditions remained unusually favorable for the development of brown rot, very little occurred in this block, in which harvest was completed by June 29. The results were so favorable that three growers in the vicinity used sodium hypochlorite (two used 1 1-2 gallons per 100 gallons and one used one gallon per 100 gallons) on their Early Elbertas, applying the sprays on June 27 and 28 and completing their harvest about July 9. In each case, very good results were reported.

This author suggests that, in view of the very favorable results obtained so far on peach diseases, sodium hypochlorite should be tested for the control of various diseases on other plants, and states that such tests are being made at the University of Arkansas. He concludes that it seems likely that its use for the control of plant diseases may become very widespread, perhaps being limited only by possible toxicity to certain plants.

CLAYS

Particularly Suitable for Use in

AGRICULTURAL DUSTS

- NON-ABRASIVE
- NON-ALKALINE

Technical Data together with Testing Samples Sent upon Request

UNITED CLAY MINES CORPORATION
TRENTON • Established 1905 • NEW JERSEY

Have You a DUST BLENDING PROBLEM?

Our Engineers will be glad to help you to solve any mixing or blending problem you may have.

SPECIALISTS in INSECTICIDE DUST BLENDING EQUIPMENT

Address Inquiries to . . .

The YOUNG MACHINERY COMPANY

MUNCY PENNSYLVANIA

HEAVY DUTY MULTI-WALL

SHIPPING SACKS

OPEN-MOUTH
VALVE-TYPE
PASTED AND SEWN

KRAFT BAG CORPORATION

630 FIFTH AVE., NEW YORK 20, N.Y.
MILLS AT GILMAN, VT.

For Many Years . . .

The trade has depended upon the service and good name of

DERRIS, INC.

For some of its most exacting needs.

- 4-5% Rotenone DERRIS Powder
- 4-5% Rotenone Cube Powder
- 5% Rotenone Oil Concentrate
- 1½% Rotenone Emulsifiable Concentrate
- Cube Resins — with definite Rotenone Content

DERRIS, INC.

79 Wall St. New York 5, N. Y.

Factories and Laboratories, Metuchen, N. J.

"COHUTTA"

POWDERED TALC

An excellent carrier for insecticides and fungicides. Produced by

Cohutta Talc Co.

Dalton - - - Georgia

NEW SERVICE AVAILABLE!

We can be of real help to you in

1. Evaluation of agricultural chemicals by means of field tests.
2. Rapid soil and plant tests for fertilizer and lime recommendations.
3. Consultation on herbicidal or fertility problems.

Inquiries invited

DR. WOLF'S AGRICULTURAL LABORATORIES

R. #4, Bridgeton, N. J.

Kansas Station Reports

In an effort to appraise the effect of sprays and certain practices on fruit foliage, entomologists at Kansas State Agricultural Experiment Station ran three groups of experiments. In the first series of tests, the problem was to determine the influence of ammonium sulfate fertilizer and wettable sulfur foliage spray treatments on the internal structure and photosynthetic activity of apple leaves. Average size of leaves and gain in tree dry weight were greater in the untreated than in the treated trees, but there was no significant difference in the chlorophyll content of leaves of treated and untreated greenhouse grown trees.

In the second set of tests to determine the influence of some spray materials on the chlorophyll content of apple leaves four spray treatments, using DDT, "Fermate," lead arsenate, sulfur-lead arsenate and zinc sulfate-lead arsenate, were applied to Winesap and Jonathan foliage. Chlorophyll content of the leaves was reduced slightly as compared with unsprayed leaves, the report states.

INSECT CONDITIONS

(Continued from page 17)

this pest is not particularly heavy.

European red mite populations continued to build up in most orchard areas during the last half of July. By the end of that month they were creating a difficult control problem in many apple and peach orchards of New Jersey, and were causing considerable damage in many orchards of northern Ohio.

Moderate to heavy infestations of the Mexican bean beetle persisted during the last half of July along the Coastal and Gulf regions from New York to Mississippi and in northwestern Tennessee. The infestation in central and northern South Carolina was said to be the heaviest in many years. The potato leafhopper continued numerous on beans in New York, North Carolina, and Ohio. The bean leaf beetle was also infesting that crop toward the end of July in Mississippi and northwestern Tennessee.

The tomato hornworm was unusually abundant in some Eastern states during the last half of July. The tomato fruitworm also caused serious damage in parts of New Jersey, Alabama, and California, and lighter populations were reported from South Carolina, Mississippi, and Utah. The onion thrips has persisted as a serious pest in New York, Ohio, Wisconsin, and Utah. The outbreak of the potato psyllid on potato and tomato in Nebraska, Colorado, and Wyoming, as mentioned in this column last month, continued throughout July. By the end of July, the tuber flea beetle was numerous on potato in central Washington and lighter numbers occurred in Nebraska and Wyoming.

Aphids were destructively numerous on many vegetables in widely separated districts during the last half of July. They caused considerable damage to crucifers in parts of New Jersey, New York, North Carolina, Idaho, and California, but were less numerous in Wisconsin and Utah. Populations were on the increase toward the end of the month on potatoes in Maine and in Washington. The hop aphid was infesting the burs of hops in central Washington; the melon aphid was injuring cucurbits in New Jersey; the bean aphid was numerous in some bean fields of southern California; and the green peach aphid was damaging peppers in that state.

The aphid infestation on tobacco in South Carolina had almost completely dissappeared shortly after mid-July, due apparently to natural factors. Single fields in Maryland were heavily infested with aphids toward the end of the month. There was a resurgence of heavy aphid infestations on tobacco in northwestern Tennessee and by the end of July the situation in that section was more serious than at any time during the season.

Supplying the Nation

We are in a position to supply any mixtures of soluble mineral salts, copper, manganese, zinc, iron, etc.

One of the nation's foremost producers of agricultural chemicals and soluble mineral salts.

For complete information, write the Tennessee Corporation, Grant Bldg, Atlanta, Ga. or Lockland, O.

COPPER SULPHATE

•

ZINC SULPHATE

•

COPPER CARBONATE

•

MANGANESE SULPHATE

TENNESSEE TC CORPORATION

STATION BULLETINS

(Continued from page 55)

small grains, corn and sorghums is discussed, as is the control of brush with various combinations of materials. Methods of application are covered, with additional information on special cases such as poison ivy, brambles, mesquite, sage brush etc.

INSECTICIDES

(Continued from page 37)

Already the material (Lindane) is being offered commercially in wet-powder form in 1 and 4 lb. bags as well as 50 and 100 lb. containers.

It is of interest that the press release indicated that tests were being conducted by the Bureau of Entomology and Plant Quarantine, Food & Drug Administration, and Rutgers University as well as by the manufacturers of Lindane insecticides, which showed that if residual applications of Lindane are made as recommended, milk will not be contaminated. The U.S.D.A. stated further that no adverse odor had been detected from herds housed in barns treated with this insecticide.

Rotenone

USE of rotenone during this past season was substantially greater than it was during the past 2 or 3 years, but the rotenone processors were disappointed that there was not a greater use in view of the initial furor over the use of chlorinated hydrocarbons insecticides. Supplies were adequate and the price remained fairly stable throughout the season.

Na Salt of 2,4-D

(Continued from page 43)

2 ppm plant produced a single "etiolated" blossom of a light pink rather than bright red color 3 weeks after the check. After bean plants had been exposed to 2,4-D in excess of 0.5 ppm in the nutrient solution, no flowers were formed at all due to complete cessation of growth. Painting of bean leaves with the hormone resulted in a decrease in the number of blossoms put forth, a minimum number appearing at the highest 2,4-D concentration. As a result, fruit yield was decreased.

Application Methods Compared

OBSERVATIONS on the effects of the two different methods of 2,4-D application served to give some indication of the translocation route of this compound in various plants. In most cases where treatment was applied through the roots, the stimulus traveled upward through the stem and elicited a response in points as remote from the point of application as the youngest growing tips. In fact, the youngest most

PYROPHYLLITE

Ideal As A

DILUENT

AND

CARRIER

FOR

INSECTICIDES

•

CAROLINA PYROPHYLLITE COMPANY

10 EAST 40th ST. NEW YORK 16, N. Y.

Plants and Mines Located at

STALEY, N. C. and GLENDON, N. C.

Ask For Our Pamphlet

It pays to handle a guaranteed product

HERBICIDE

THE ORIGINAL

WEED KILLER

(NON-SELECTIVE)

Kills Grass and other Weed Growth on Driveways, Paths, Tennis Courts, Golf Traps, Coble Gutters, Factory Yards and Sidings, Parking Lots or any place where vegetation is not wanted.

Write for Literature and Prices

READE MFG. CO., INC.

Established 1883

Main Office: JERSEY CITY 2, N. J.

Factories: Jersey City, Chicago, Kansas City

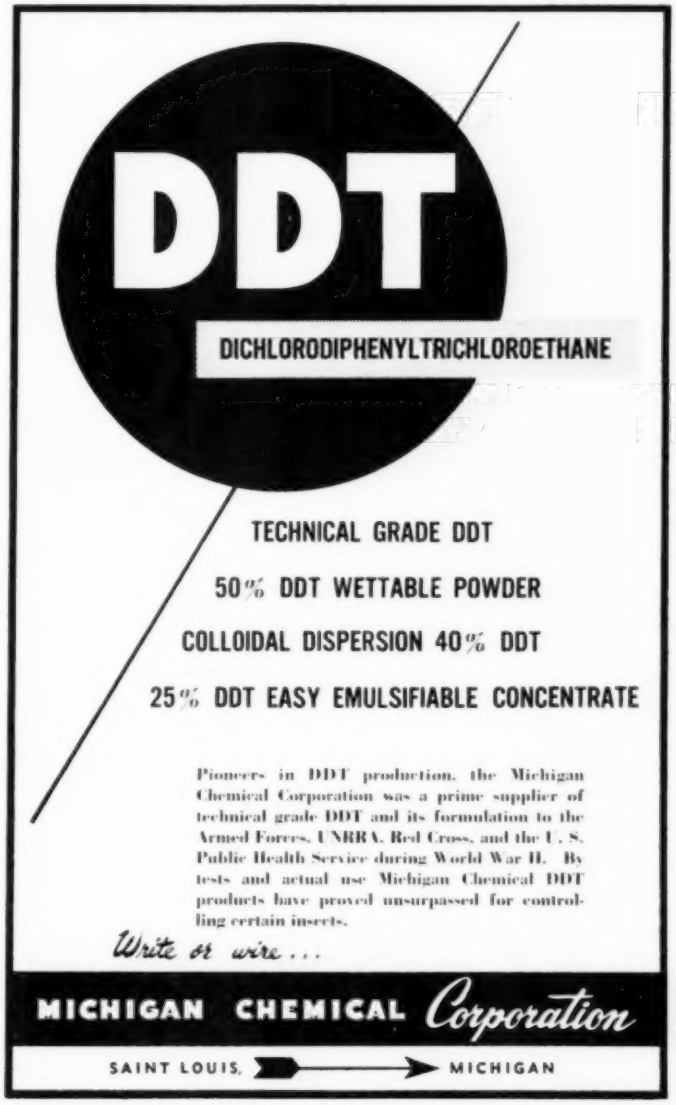
Please address all correspondence to main office.

vegetative portions were generally the first to show typical epinastic or hyponastic responses after such treatment.

On the other hand, where 2,4-D was applied to the aerial portions, in no case was there a root response more serious than a slight reduction in size, observed only on the tomato plants. That the stimulus reached the lower stem of tomatoes was evidenced by the appearance of root primordia on this portion of tomato plants whose leaves were painted with the hormone as well as on stems of plants which had received root treatment. Flower primordia obviously received the stimulus at the highest concentrations with both methods of application, since the fruit produced was smaller than normal and badly misshapen, similar to those obtained by Weaver after spraying tomato with ammonium 2,4-dichlorophenoxyacetate. Concentrations of 1 to 4 ppm did not prove lethal to tomato since new growth, however abnormal in appearance, did appear after exposure of the plants to the hormone except at the highest concentration (4 ppm) in the root treated series.

The bean plants receiving root applications of 2,4-D showed responsive curvature and accompanying effects at all concentrations above 0.5 ppm. The action of the hormone was rapid and caused a complete cessation of growth in the aerial portions of each of these plants, apparently killing all leaf and flower primordia. The root, however, was not affected. On the other hand, 2,4-D effects from foliage treatment of snap beans were observed only on the apical leaves which had actually received the application. Though these portions became severely affected, the stimulus was obviously not readily translocated to the stems since axillary shoots developed normally. Mitchell and Brown (10) also observed that 2,4-D was not readily translocated from young rapidly growing leaves to stems of snap bean plants. Root systems were also unaffected by treatment of the shoot apex. However, the stimulus did appear to reach the flower primordia since increase in 2,4-D concentration was accompanied by a corresponding decrease in flowering and in subsequent fruit yield, reaching a minimum at 4 ppm, and the pods thus produced were curled and undersized even at the lowest concentration (1 ppm).

The response made by corn at these concentrations was not typical in so far as growth curvature was concerned. Root treatment appeared to cause wilting within 2 to 5 days, retardation of growth, and eventual death of the corn plants when applied in solution culture, but only leaf chlorosis similar to that ascribed to iron deficiency when applied at corresponding concentrations in sand culture. Wilting was observed also by Taylor on soybeans and kidney beans exposed for 2 weeks to a nutrient solution containing over 0.6 ppm 2,4-D. The painted plants exhibited the


DDT
DICHLORODIPHENYLTRICHLOROETHANE
TECHNICAL GRADE DDT
50% DDT WETTABLE POWDER
COLLOIDAL DISPERSION 40% DDT
25% DDT EASY EMULSIFIABLE CONCENTRATE
Pioneers in DDT production, the Michigan Chemical Corporation was a prime supplier of technical grade DDT and its formulation to the Armed Forces, UNRRA, Red Cross, and the U. S. Public Health Service during World War II. By tests and actual use Michigan Chemical DDT products have proved unsurpassed for controlling certain insects.
Write or wire . . .
MICHIGAN CHEMICAL Corporation
SAINT LOUIS, MICHIGAN

Now you can get Fur-Ag, the popular organic conditioner in convenient 100 pound bags. This free-flowing organic conditioner speeds curing, and helps prevent mixed goods from caking. Here is an inexpensive conditioner that is sterilized before shipment—freed from plant diseases, insects, seeds and similar contaminants.

Fur-Ag is produced at Memphis, Tennessee and is available in volume the year around. Prices and more complete information on request.

The Quaker Oats Company

Chemicals Department
1890 Board of Trade Bldg.
141 W. Jackson Blvd., Chicago 4, Ill.

VELVEX

KAOLIN CLAY

For Use in Extending Insecticidal Materials

- Non-Abrasive
- Small Particle Size
- Chemically Adaptable
- Good Adhesive Qualities

For information and samples, write:

SOUTHEASTERN CLAY COMPANY

AIKEN, SOUTH CAROLINA

MUL-SI-MO

AN EMULSIFIER OF PETROLEUM OILS

Economical - Effective

MUL-SI-MO is especially adapted for the rapid emulsification of Oils whose viscosity is 120 Saybolt or less.

RANGE COVERED

Oils with a viscosity of 120 Saybolt or less cover the great majority of oils used in Dormant and Summer Sprays.

GENERAL TEXTURE

Mul-si-mo is a thin amber-colored oily liquid about the same viscosity as Kerosene Oil.

METHOD OF USE

There is nothing complicated about the use of *Mul-si-mo*. It is just poured into the oil to be treated at the rate of ½ to 1½, depending upon the tightness of emulsion desired—then thoroughly stirred—and the process is completed.

RESULT OF MIXING AS ABOVE

A practically 100% Oil Product—No Water—No Soap—No Potash nor other Alkalines.

NEUTRAL PRODUCT

Mul-si-mo is Neutral. Mul-si-mo-Made Emulsions are not adversely affected by pronounced saline, alkaline or acid re-acting waters.

ECONOMICAL TO USE —LOW COST

Mul-si-mo, we believe, is the cheapest and most economical Emulsifier on the market for the emulsification of the oils above specified.

NON-TOXIC TO PLANTS

Extensive tests have shown *Mul-si-mo* to be non-toxic to plants when used at a dilution of 1 to 100. (Plants used in tests Coleus.) As summer oils are usually used at the dilution of half-gal. to 100 gals. water, at such dilution the rate of *Mul-si-mo* to water would be 1 to 20,000.

COST OF MUL-SI-MO

Per Gallon $4.00; 5 Gallons and up @ $3.75 per Gallon; 50 Gallon Drums @ $3.50 per Gallon, f.o.b. New York or Jersey City. (Above prices for U. S. only. Foreign prices on request.)

MUL-SI-MO SAMPLES

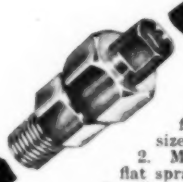
A 4 Oz. Sample will be sent upon request.

Mulsimo Products, Inc.

CRANBURY, N. J.

address all communications to
25 Paulus Boulevard, New Brunswick, N. J.

MONARCH WEED SPRAYS



Note these features:

1. Removable tip and strainer assembly. Unnecessary to disturb pipe connection for cleaning or changing sizes.
2. Milled flats tell direction of flat spray by "feel."
3. Threaded strainer cannot jar loose from vibration.
4. Produce absolutely uniform spray from edge to edge—no "end jets" to cause uneven coverage.
5. High velocity "non-fogging" penetrating sheet—an important factor where there is any wind.
6. Uniform capacities because of accurate machining.
7. Long straight wall orifice for extra wear—no "feather" edges to wear away quickly.
8. Built in strainer—largest screen opening less than half the diameter of the smallest orifice size.

MONARCH MFG. WKS. INC.

3406 MILLER ST. PHILA. 34, PA.

Western Distributor: W. A. Westgate, Davis, Cal.

same chlorosis described above but showed no retardation in growth. In water culture corn roots were killed, whereas in sand culture they were injured only to the extent that hypertrophic swellings appeared. Reduction in size and wilting of plants treated with 2,4-D in the solution medium might have been a result of root killing by 2,4-D rather than of a specific reaction within the aerial parts.

Poinsettias exhibited, perhaps, the most rapid transfer of the 2,4-D stimulus from root to foliage and the most severe degree of epinastic curvature, but strangely enough, these plants showed the least permanent effects. Though the plants treated through the roots were distorted into grotesque configurations, they all recovered in time to become completely normal plants. However, there was a delay in the development of the red coloring in the floral bracts which was dependent on the concentration of 2,4-D applied. Painting of the terminal buds at corresponding concentrations produced even more temporary results and only a very slight delay, if any, in flowering.

Geranium was the first species, aside from corn in solution culture, to show killing effects due to low concentrations of 2,4-D. Although the plant treated with 1 ppm through the roots remained unaffected throughout the experiment, plants from the two highest concentration treatments were killed within a week after a single root application, even though the sand had been thoroughly flushed with distilled water following 2,4-D treatment. Though 1 ppm did not interfere with normal flowering, 2 ppm of the hormone resulted in the production of a single abnormal flower. In painting the terminal buds with corresponding concentrations, only the floral parts appeared to be visibly affected. Possibly the thickness and presence of hairs on the geranium leaves impeded the entry of 2,4-D.

Curtailment of growth to the point of death was observed also in nasturtium and buckwheat plants subjected to root applications of 2,4-D in minute concentrations. The rate of killing in both cases corresponded with the concentration level of the chemical. In each case, death of the aerial portions coincided with discoloration and disintegration of the root system of the plant in question. Death occurred first to the primary leaves and progressed upward along the stem in the nasturtium and buckwheat as in the case of geranium. It is significant that Taylor (16) also observed the same progression in wilting of soybeans treated with 25 ppm 2,4-D in the nutrient solution. Buckwheat, already in blossom at the time of treatment showed injury to the blossoms corresponding with concentration levels of the hormone. In the case of nasturtium there was no opportunity to observe the effects of 2,4-D on flowering since the plants died long before reaching the flowering stage.

These experiments, though carried out with plants grown in sand and solution culture, might give an indication of possible injury to economic plants growing in nature as a result of contamination by trace amounts of 2,4-D in the soil. Although such injury could hardly result from judicious use of recommended rates of 2,4-D for soil or spray application, dangerous concentrations might be built up in the soil through incorrect technique in applying the hormone. The hazard appears to be even greater with effluents from industrial plants engaged in the manufacture of 2,4-D compounds. Although De Rose (4) has emphasized the fact that small concentrations of this chemical in the soil generally lose their herbicidal activity in a relatively short time (within 80 days), it has been demonstrated that they may produce injurious effects on certain plants of economic value long before the material has been completely leached or otherwise dissipated from the soil.

References

(1) Avery, Johnson, Addoms, Thompson. 1947. Hormones and Horticulture. McGraw Hill Book Co., Inc. N. Y. p. 221.

(2) Capinpin, R. and Ocfemia, G. 1948. A study of weed eradication with 2,4-D in lawns, vacant lots, and pastures. Philippine Agriculturist XXXI No. 4: 239–255.

(3) Dunlap, A. A. 1948. 2,4-D injury to cotton from airplane dusting of rice. Phytopath. 37: 367–369.

(4) De Rose, H. 1946. Persistence of some plant growth-regulators when applied to the soil in herbicidal treatments. Bot. Gaz. 107: 583–589.

(5) Gilbert, F. A. 1947. Damage to grapes from 2,4-D spray residue. Hort. News (N. J.) 28: 2002.

(6) Green, M. and Fowler, H. 1948. Indole-3-acetic acid and flowering. Science 108 No. 2807: 415.

(7) Hamner, C. L. and Tukey, H. B. 1944. Selective herbicidal action of midsummer and fall applications of 2,4-Dichlorophenoxyacetic acid. Bot. Gaz. 106: 232–245.

(8) Johansen, F. D. 1946. 2,4-D injury at College Farm. Hort. News (N. J.) 29 No. 5.

(9) Johnson, E. M. 1947. Injury to plants by minute amounts of 2,4-D. Phytopath. 37: 367–369.

(10) Mitchell, J. W. and Brown, J. W. 1946. Movement of 2,4-Dichlorophenoxyacetic acid stimulus and its relation to the translocation of organic food materials in plants. Bot. Gaz. 107: 393–407.

(11) Pirone, P. P. 1946. Injury to trees. Proc. National Shade Tree Comm. 107–119.

(12) Pridham, A. 1947. Delayed action of 2,4-D on trees, shrubs, and perennials. Proc. Amer. Soc. Hort. Sci. 50: 395.

(13) Shive, J. W. and Robbins, W. 1942. Methods of growing plants in solution and sand cultures. N. J. Expt. Sta. Bull. 636.

(14) Staten, G. 1946. Contamination of cotton fields by 2,4-D or hormone type weed sprays. Jr. Amer. Soc. Agr. 38: 536.

(15) Swanson, C. P. 1946. Histological responses of the kidney bean to aqueous sprays of 2,4-D. Bot. Gaz. 107: 522–531.

(16) Taylor, D. L. 1946. Observations of growth of certain plants in nutrient solutions containing synthetic growth-regulating substances. 1. Some effects of 2,4-D. Bot. Gaz. 107: 597–611.

(17) Taylor, D. L. 1946. Observations on growth of certain plants in nutrient solutions containing synthetic growth-regulating substances. 2. The influence of presentation time. Bot. Gaz. 107: 611–619.

(18) Thurlow, J. and Bonner, J. 1947. Inhibition of photoperiodic induction in Xanthium. Amer. Jr. Bot. 24 Abs.

(19) Weaver, R. J. 1946. Effect of spray applications of 2,4-D acid on subsequent growth of various parts of red kidney bean and soybean plants. Bot. Gaz. 107: 532–539.

(20) Weaver, R. J. and Swanson, C. P., Ennis, W. B., Boyd, F. T. 1946. Effect of plant growth-regulators in relation to stages of development of certain dicotyledonous plants. Bot. Gaz. 107: 563–568.

Growers use more Triangle Brand Copper Sulphate on their crops—as a protection against plant diseases—*than any other product.*

Triangle Brand is a quality product, made by modern methods, backed by 50 years of experience—a time-tested product giving you "Efficient, Low Cost Protection."

Your dealer can supply you with Large Crystals, Small Crystals, Superfine, Snow, Instant (free-flowing powder) for your Bordeaux Sprays . . . Monohydrated for Copper-Dust mixtures.

FREE! Send postcard today for *valuable booklets* "Bordeaux Mixture—its Efficient Preparation and Use"; "Bordeaux Controls Late Blight on Tomatoes." Timely, *tested* information!

Also Z-C BRAND ZINC SULPHATES

PHELPS DODGE REFINING CORPORATION

40 Wall Street, New York 5, N. Y.
250 N. Michigan Ave., Chicago 1, Ill.

FLORIDA FIELD TESTS Of Agricultural Chemicals

Testing new fungicides, insecticides, herbicides, and soil treatments in the field.

Your research and development on new agricultural chemicals can be accelerated by an added season of testing in the field in southern Florida. Materials can be screened in the winter tests to facilitate the usual summertime tests in the north.

Arrange now for tests next winter. Our season extends from September to May.

References and rates upon request.

Dr. G. R. TOWNSEND

P.O. Box 543 **Belle Glade, Fla.**

PARIS GREEN

Dow Chemical Co. Brand

•

Packed 12 x 4 lb. tins per case

Carload and L.C.L. Quotations on request

•

BARCLAY CHEMICAL

COMPANY INCORPORATED

75 Varick St. **New York City**

WOrth 4-5120

"PHYLLITE"

(TRADE NAME)

PYROPHYLLITE

—•—

The World's Greatest Diluent & Carrier Absolutely Non-Abrasive and Adheres Readily to Foliage and all Surfaces.

PHYLLITE'S UNIFORMITY IS UNSURPASSED

A chemical analysis run consistent in every batch of PHYLLITE assures the insecticide manufacturer of absolute uniformity for use as a diluent and carrier. PHYLLITE is ground in a Raymond Mill—95% through 325 mesh. Has a low pH (5.1).

IMMEDIATELY AVAILABLE

- *Write us for helpful information and a generous sample.*
- *Packed in 50 lb. valve bags. 20 ton lots. Lowest prices on West Coast. F.O.B. plant.*
- *Smaller quantities if desired.*

—•—

PIONEER PYROPHYLLITE PRODUCERS

HANCOCK 2-2992

P.O. BOX 686 CHULA VISTA, CALIF.

Industry Patents

2,474,831. METHOD FOR DEFLUORINATING PHOSPHATE ROCK. Patent issued July 5, to Kelly L. Elmore, Sheffield, Ala., assignor to Tennessee Valley Authority. A process for defluorinating phosphate rock which comprises introducing a charge consisting of phosphate rock and naturally occurring siliceous material, in which the proportion of silica is in excess of that required to satisfy the equation

$$Ca_3F_2(PO_4)_2 + H_2O + SiO_2 \longrightarrow 3[Ca_3(PO_4)_2] + CaSiO_3 + 2HF$$

into a vertical reaction zone in discrete masses; continuously directing a stream of hot combustion gases, containing not less than 4 per cent of water vapor, substantially vertically upward against the bottom of the charge; passing the hot combustion gases upward through the central parts of the charge at a substantially greater rate of flow than the rate of flow of said gases through those parts of the charge adjacent to the walls of the reaction zone so that the upper portion of the charge forms a sintered ring surrounding a central melting zone; withdrawing the resulting molten material, from which the greater proportion of fluorine has been volatilized, from a lower part of the reaction zone; and at intervals adding fresh portions of charge to the upper part of the body of charge in the reaction zone.

2,474,833. METHOD FOR MAKING ORGANIC FERTILIZER. Patent issued July 5, to Eric W. Eweson, New York, N. Y. The method of making organic fertilizer by the decomposition of moist organic material through the propagation of aerobic bacteria therein which comprises continuously forcing air under pressure through an enclosed mass of such material, all of said air being introduced into the mass from the bottom thereof, and continuously withdrawing spent air which has passed through the mass and gases generated within the mass at vertically spaced intervals throughout the mass.

2,475,629. METHOD OF PEST CONTROL. Patent issued July 12, to E. R. Meincke, Stamford, Conn., assignor to American Cyanamid Co., New York. A method of protecting materials from insects, fungi and bacteria which comprises applying to said materials a pest control composition containing as an essential active ingredient an alkyl ester of a member of the group consisting of aconitic acid, its homologues and its isomers.

2,475,702. NOZZLE. Patent issued July 12, to Fred W. Funke, Oakland, Calif., assignor to Robert St. J. Orr, San Francisco, Calif. A dual discharge nozzle comprising a housing formed with an inlet passageway having one of its ends opening outwardly of said housing at one side of the latter and formed with a pair of discharge passageways each having an end opening outwardly of said housing at the opposite side of said housing, an enlarged chamber formed in said body with which one end of each said passageways communicate, a valve body rotatable in said chamber formed with ports arranged for establishing communication between either and both of said discharge passageways and said inlet passageway as desired upon rotating said body about its central axis to predetermined positions, a tubular screen disposed within one discharge passageway of said pair and extending radially of said axis and coaxial with the port in said body that is adapted to communicate with said one discharge passageway when said body is turned to effect such communication, the walls of said one discharge passageway being enlarged around said screen intermediate the ends of said screen and said one discharge passageway extending from said enlarged portion to its end that opens outwardly of one side of said housing, a clean-out passageway formed in said housing communicating between the end of said screen that is outwardly of said valve body and the outside of said housing, and a valve in said clean out passageway for opening and closing the latter to flow of fluid therethrough.

2,475,449. SPRAYING MACHINE. Patent issued July 5, 1949, to George W. Daugherty, Orlando, Fla. In a machine of the class described, a tank at one end thereof, a propeller adapted to generate an air blast, an air guide chamber formed for the movement therethrough of said aid blast secured at the other end of said machine, means for pumping spraying material from said tank to said air blast to be formed by said air blast into a fine fog of material, movable air guide means secured at the exhaust end of said air guide chamber for directing the air blast issuing therefrom, a tube secured in said tank to form an open passageway therethrough, and means for moving said air guide means extending from said air guide means to said tank and through said tube to the other end of said tank for manual manipulation.

2,476,960. SPRAYING AND DUSTING MACHINE. Patent issued July 26, 1949, to George W. Daugherty, Orlando, Fla. In a machine of the class described, a tunnel, an air propeller having a central imperforate hub portion and a series of blades, means mounting said propeller for rotation in an axis longitudinal and substantially central of said tunnel for developing a flow of air longitudinally through said tunnel, a cylindrical shell substantially the same in diameter as the hub portion of said air propeller secured in said tunnel coaxially with said propeller and forming with said tunnel an air ring for the passage of the air blast generated by the blades of said propeller, and means for feeding an insecticide or the like positioned relatively to said air ring whereby the ring-like blast of air generated through said air ring will pick up the insecticide fed by said means and form it into a fine fog.

2,477,465. MANUFACTURING TETRAETHYL LEAD. Patent issued July 26, to R. J. Plunkett, Woodstown, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. In the process of making tetraethyl lead by the reaction of ethyl chloride on lead monosodium alloy, the improvement which comprises carrying out the reaction in the presence of a small proportion, sufficient to accelerate the reaction, of an acetal of the class which consists of acetals consisting of carbon, hydrogen and two oxygen atoms and corresponding monochlorine and dichlorine substituted acetals.

TRADE MARK APPLICATIONS

FAESY & BESTHOFF, INC., white capital letters on black scroll, with outlines of letters "fb" as background, for paradichlorobenzene, lime sulfur solution, etc. Filed Mar. 10, 1948, by Faesy & Besthoff, Inc., New York. Claims use since May 26, 1947.

AFRICANO, in hand-lettered capitals, with drawing of lion's head at top. For raticides, insecticides and fungicides. Filed July 22, 1948, by David M. Langer, doing business as Africano Laboratories, New York. Claims use since July 19, 1948.

UNI-CULTURE, in arc-shaped capital letters, for bacterial inoculants for leguminous plants. Filed Nov. 12, 1947, by Kalo Inoculant Co., Quincy, Ill. Claims use since 1938.

CAL PLUS, in outline letters, for fertilizer material and soil builder composed of a marl deposit of calcium carbonate. Filed Mar. 1, 1948, by Washington Natural Products Co., Seattle, Wash. Claims use since Jan. 7, 1948.

JITTER BUG, in caps and small caps, for insect repellent. Filed May 27, 1948, by Sayman Products Co., St. Louis, Mo. Claims use since June 26, 1941.

FRITILIZER, in slender capital letters, for finely divided fused admixture of feldspar and phosphate rock, for fertilizer. Filed May 26, 1948, by Ferro Enamel Corp., Cleveland, Ohio. Claims use since Mar. 9, 1948.

CHATELIER'S, in script type, for plant food and fertilizer mixtures. Filed June 14, 1948, by Paul A. Chatelier, doing business as Chatelier Laboratories, St. Petersburg, Fla. Claims use since Oct. 1, 1939.

FUM-I-KILL, in lower case letters, for moth killing liquid chemical compound. Filed Nov. 4, 1947, by Wade, Wenger & Associates, Inc., Chicago. Claims use since 1932.

DIAMOND SHAPED DESIGN, with letters in each corner, for insecticides. Filed Nov. 24, 1947, by Sameo Mfg. Co., Ltd., Trinidad, British West Indies. Claims ownership of Trinidad Registration No. 40, dated June 21, 1946.

DR. SALISBURY'S, in capital letters, with a motif of a cross superimposed, for insecticides, herbicides, rodenticides, etc. Filed Apr. 30, 1948, by Dr. Salisbury's Laboratories, Charles City, Iowa. Claims use since Nov. 19, 1947.

HOLD-TITE, in capital letters, for horticultural hormone spray for fruit trees for reducing the pre-harvest drop of fruit. Filed May 18, 1948, by John Lucas & Co., Inc., doing business as Lucas Kil-Tone Co., Philadelphia, Pa. Claims use since Apr. 15, 1941.

LUCAS, in script, for insecticides, fungicides, germicides and horticultural sprays. Filed May 18, 1948, by John Lucas & Co., Inc., doing business as Lucas Kil-Tone Co., Philadelphia. Claims use since January, 1923.

DESMANTHACIDE, in small capital letters, for chemical toxicants for use in the manufacture or formulation of herbicides. Filed May 24, 1948, by Monsanto Chemical Co., St. Louis, Mo. Claims use since Mar. 25, 1948.

(Turn to page 88)

Classified Advertising

POSITIONS OPEN

Sales Manager: Established midwest manufacturer of insecticides, fungicides, weed killers. A real opportunity for an experienced sales manager with knowledge of midwest wholesalers, canners and dealers. State age, experience, compensation desired and present position. Address Box 375 care of Agricultural Chemicals.

Sales Manager: Experienced—for manufacturer of agricultural spray materials—New York Home Office. Address Box 376 care of Agricultural Chemicals.

POSITIONS WANTED

Chemical Sales Executive: 35, well known, completely grounded in agricultural and industrial markets (bulk and consumer package). Product development, field research and sales administration. Knowledge organic fungicides, herbicides, insecticides, detergents, antiseptics, germicides, textile finishes, resins, rubber compounds, emulsifiers, degreasers. Seeks responsible position with progressive manufacturer chemical or allied field. Locate New York or environs. Address Box 377, care of Agricultural Chemicals.

Export Manager: Chemicals and allied products, top performance record, go getter, A-1 background, worldwide contacts, with extensive purchasing experience domestic and abroad, must leave New York for health reasons, age 41, desired association with aggressive management or export franchise. Financially sound. Can locate anywhere. All correspondence strictly confidential. Kindly address Box 378, care of Agricultural Chemicals.

MISCELLANEOUS

Will Buy: Established chemical business, manufacturing, wholesale, retail, mail order or export, or wish to acquire partnership. Present volume of business of secondary importance, provided business offers real opportunity for promotion minded aggressive sales personality of high ethical standing. Please reply to Box 379, care of Agricultural Chemicals.

West Coast Sales—Organization covering west coast can handle sales and distribution of line of agricultural chemical products in that territory. Experienced sales staff which knows agricultural buyers. Give details of line to be sold, present set-up, etc. This well known distributor can do an excellent selling job for the right manufacturer. Address Box 380, care of Agricultural Chemicals.

Close Out Sale of Hudson Sprayers and Dusters: 435 Cardinal Sprayer, 3 quart $9.00 dozen—661 Signal Duster, $2.50 dozen—766 Admiral Duster, $9.00 dozen. All prices are F.O.B., New York, N. Y. Address Box 381, care of Agricultural Chemicals.

ALVIN J. COX, Ph.D.
Chemical Engineer and Chemist

(Formerly Director of Science, Government of the Philippine Islands. Retired Chief, Bureau of Chemistry, State of California, Department of Agriculture.)

ADVISER ON AGRICULTURAL CHEMICAL PROBLEMS AND INVESTIGATIONS

Consultant in reference to spray injury and damage, claims, including imports of fruits and nuts, formulas, labeling, advertising and compliance with law.

1118 Emerson Street
Palo Alto, California

CONSULTING ENTOMOLOGIST

Insecticides — Formulation
Plant Pathology—Research
Entomology—Legal Service

Author of
"Chemistry & Uses of Insecticides"
DR. E. R. de ONG
926 Stannage Ave., Albany 6, Calif.

Dr. Linduska is Appointed

The Fish and Wildlife Service of the Department of the Interior has announced that Dr. Joseph P. Linduska, a pioneer in the military development of DDT, has been appointed assistant chief of the wildlife research branch of the Service.

•

Connecticut Field Day

Connecticut Agricultural Experiment Station was to hold its annual field day on the experimental farm at Mt. Carmel, Conn. According to the program issued by the Station in advance of the meeting, visitors attending the event were to inspect experimental plots and exhibits in the morning session, and were to have lunch on the grounds. In the afternoon a meeting was to be held under a tent, with an address by Dr. John D. Black, professor of economics, Harvard University, being featured. Dr. James G. Horsfall, director of the Station, was to greet the visitors officially.

•

TCA in 10-Lb. Drums

Dow Chemical Co., Midland, Michigan, has announced that its herbicide product, "Dow Sodium TCA" is scheduled to be marketed in ten-pound fiber drums. This package is for the convenience of small consumer trade, and also for larger operators who desire to test the material on a small scale. The agricultural chemical sales division of the company stated that the ten-pound drum would be available by mid-September, in time for fall treatment.

TRADE MARKS

(Continued from page 87)

MANZATOX, in capital letters, for chemical toxicants for use in the manufacture or formulation of herbicides. Filed May 24, 1948, by Monsanto Chemical Co., St. Louis, Mo. Claims use since Mar. 25, 1948.

ARROWHEAD, in heavy capital letters, for hydrated lime and quicklime sold as chemicals in the production of insecticides and other commodities. Filed Aug. 2, 1948 by United States Lime Products Corp., Los Angeles, Calif. Claims use since January, 1922.

SIERRA, in heavy capital letters, for hydrated lime and quicklime sold as chemicals for use in the production of insecticides and other commodities. Filed Aug. 2, 1948, by United States Lime Products Corp., Los Angeles, Calif. Claims use since Aug. 16, 1924.

DUODEX, in outline capital letters, for insecticidal and fungicidal composition. Filed Aug. 23, 1948, by Nuodex Products Co., Inc., Elizabeth, N. J. Claims use since July 16, 1948.

SEEDOX, in sans serif capital letters, for fungicide. Filed Mar. 4, 1948, by Sindar Corp., New York. Claims use since Dec. 5, 1946.

OCTAGONAL SHIELD WITH CIRCLE AND LETTER "H" IN CENTER, for insecticides, disinfectants and chlordane. Filed Sept. 10, 1948, by Julius Hyman & Co., Denver, Colo. Claims use since Dec. 10, 1946.

TUSSIL, in ultra bodoni capital letters, for insecticides and larvicides. Filed Nov. 8, 1948, by Southern Entomological Co., W. Palm Beach, Fla. Claims use since Apr. 15, 1948.

COOPER-TOX, in outline caps and lower case, for livestock insecticidal dip or spray. Filed Mar. 29, 1948, by William Cooper & Nephews, Inc., Chicago. Claims use since Feb. 14, 1948, on complete mark; and since Jan. 1, 1900, on "Cooper".

"Toxaphene Residues" Studied

Technical Bulletin 461, "Toxaphene Residues" has been issued by Montana State College Agricultural Experiment Station, Bozeman, Mont. Four studies are reported, all dealing with residues of toxaphene on alfalfa when fed to various domestic animals.

•

Wyoming Tests Compounds

Single sprayings of some of the new insecticides will protect dairy cows for as much as six weeks at a time against the horn fly, Wyoming Agricultural Experiment Station, at Laramie, Wyo., reports. A series of tests, while not conclusive, indicated that one application of any of the following sprays will give control for the period listed:

0.25 percent DDT, 2 to 3 weeks; 0.5 percent DDT, 2½ to 3 weeks; 1.5 percent DDT, 4 to 6 weeks; 2.5 percent DDT, 4 to 6 weeks; 1.5 percent Methoxy, 4 to 6 weeks; 1.5 percent Chlordane, 4 to 5 weeks; 1.5 percent "Rhothane", 3½ to 5 weeks.

Several new soil fumigants tested at the Wyoming station, gave almost complete control of root knot nematode in sugar beets, the fumigants being chlorine- and bromine-containing compounds. Beet yields increased from 3.3 to 4.2 tons per acre, compared to "untreated field yields, and sugar yields from the fumigated fields corresponded with the yields of beets. Beets from treated soil contained from 4,421 to 5,089 pounds of sugar per acre, while those from untreated soil contained only 3,486 pounds, the increase in sugar being from 27 to 46 percent.

Severe nematode infestations around Torrington, Wyo., have put large acreages out of production and station spokesmen say it is possible that application of new soil fumigants may provide an answer to that problem. They point out, however, that the treatment is costly and that very little is yet known about the after effects on the soil.

Advertisers' Index

Accurate Tool Co.	3rd Cover
American Cyanamid Co.	68
Andrews, W. R. E.	74
Arkansas Rice Growers Ass'n.	64
Arkell and Smiths Co.	11
Asheraft, Wilkinson Co.	78
Atlas Powder Co.	60
Attapulgus Clay Co.	4
International Paper Co.; Bagpak Division	7
Barclay Chemical Co.	86
Baughman Mfg. Co.	August
Bemis Bros. Bag Co.	15
Buffalo Turbine Co., Inc.	78
California Spray-Chemical Corp.	48
Carolina Pyrophyllite Co.	82
Champion Sprayer Co.	9
Chemical Construction Corp.	19
Cohutta Tale Co.	80
Colloidal Products Corp.	76
Commercial Solvents Corp.	August
Cotton States Chemical Co.	July
Cox, Dr. Alvin J.	88
De Ong, Dr. E. R.	88
Derris, Inc.	80
Dow Chemical Co.	50
E. I. du Pont de Nemours & Co.	65
Emulsol Corp.	69
Eston Chemicals, Inc.	75
Geigy Co., Inc.	August
General Chemical Division, Allied Chemical & Dye Corp.	18
Greeff, R. W. & Co.	71
Heckathorn & Co., Ltd.	78
Hercules Powder Co.	2nd Cover
Huber, J. M. Co.	August
Hyman, Julius & Co.	22
Int'l. Minerals & Chemical Corp.	62
Irvington Smelting & Refining Wks.	77
Johns-Manville Corp.	13
Kolker Chemical Works	44
Kraft Bag Corp.	80
Maneely Chemical Co.	16
Messinger Mfg. Co.	12
Michigan Chemical Corp.	83
Monarch Mfg. Co.	84
Monsanto Chemical Co.	21
Mulsimo Products, Inc.	84
National Technical Laboratories	August
Niagara Sprayer Corp.	20
Oberdorfer Foundries, Inc.	17
Orbis Products Corp.	August
Penick, S. B. & Co.	24
Pennsylvania Salt Mfg. Co.	6
Phelps-Dodge Refining Corp.	86
Phillips Petroleum Corp.	66
Pioneer Pyrophyllite Producers	86
Pittsburgh Agr. Chemical Co.	36
Pittsburgh Plate Glass Co.	August
Potash Co. of America	3
Powell, John & Co.	58
Prentiss, R. J. & Co.	46
Private Brands, Inc.	August
Quaker Oats Co.	84
Reade Mfg. Co.	82
Sharples Chemical Co.	56
Southeastern Clay Co.	84
Spraying Systems Co.	70
Sprout, Waldron & Co.	52
Stauffer Chemical Co.	72
Tennessee Corp.	81
Texas Gulf Sulphur Co.	August
Thompson-Hayward Co.	10
Tobacco By-Products & Chemical Corp.	54
Todd Shipyards Corp.	August
Townsend, Dr. G. R.	86
Union Bag Co.	34
United Clay Mines	79
U. S. Industrial Chemicals	4th Cover
Vanderbilt, R. T. & Co.	73
Velsicol Corp.	59
Virginia-Carolina Chemical Corp.	54
Wisconsin Alumni Research Foundation	August
Wolf, Dr. Benjamin	80
Young Machinery Corp.	80

". . . and wid dis, de Goofus Hydraulic Dredge Works, bids all you kiddies good-night!"

Broadcasting . . .

BROADCASTING is spectacular,—but expensive! Especially, if the great bulk of an audience has little or no interest in the advertising message. Why tell your sales story to millions of people when you can sell only a minute fraction of them? Why not concentrate your advertising effort where you **know** it will do you real practical good? Where it will reach your customers and prospects, and help sales directly?

Now, if it be the field of chemicals for agriculture that you want to sell, your advertising message can blanket this market at low cost and without waste if it appears in the pages of

AGRICULTURAL CHEMICALS

254 W. 31st St. New York 1, N. Y.

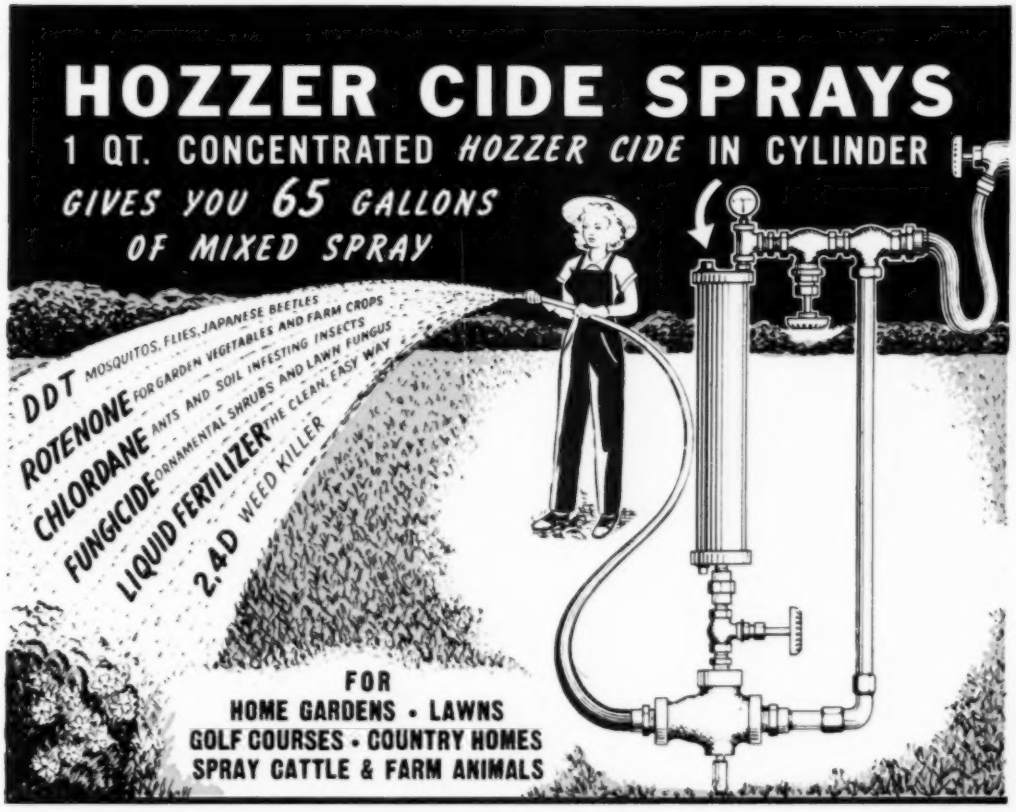
TALE ENDS

TIME was when the insecticide business was about washed up by 4th of July, but this season it has been a different story. Mid-August still finds a heavy demand, with continuing spot shortages of toxaphene, DDT, BHC, pyrethrum, even calcium arsenate.

What's the explanation? For one thing, it has been a big insect year. The grasshopper invasion lived up to advance predictions. Then there has been a new and a big market for the new insecticides on cotton pests. And one of the heaviest weevil years extant. Responsible too is the fact that "the farmers never had it so good". With Uncle Sam ready to buy everything they produce at a fat price, the sky has been the limit on agricultural production.

It is a rather odd situation for the side-line sitters to watch the government, through the U.S.D.A., supply the information and encouragement for the widest possible expansion in crop output through the use of insecticides, fungicides, weed killers, fertilizers, etc., knowing that they are going to have to absorb any resulting surplus. And a surplus there is sure to be, for the American farmer is above all a smart operator, and quick to recognize a "gravy train" when he sees one. Makes one wonder if the government hasn't become so big that it has reached the situation where the right hand isn't quite sure what the left may be doing.

There is hope for the government credit, though, in a reported invasion of the west coast by a horde of giant snails. They may eat up the food surplus, we are warned, if not controlled. Well, if they are going to do any substantial crop eating, our only hope is that they get the job done before the government buys the surplus, and not after. Working forty percent of our time for the government is bad enough, without adding to our tax bill the support of a pack of snails, —and imported snails at that!


HOZZER CIDE SPRAYS
1 QT. CONCENTRATED HOZZER CIDE IN CYLINDER
GIVES YOU 65 GALLONS OF MIXED SPRAY
DDT MOSQUITOS, FLIES, JAPANESE BEETLES
ROTENONE FOR GARDEN VEGETABLES AND FARM CROPS
CHLORDANE ANTS AND SOIL INFESTING INSECTS
FUNGICIDE ORNAMENTAL SHRUBS AND LAWN FUNGUS
LIQUID FERTILIZER THE CLEAN, EASY WAY
2,4D WEED KILLER
FOR
HOME GARDENS • LAWNS
GOLF COURSES • COUNTRY HOMES
SPRAY CATTLE & FARM ANIMALS

BUGHOZZER

OPERATES ON REGULAR HOUSE WATER PRESSURE

An applicator for insecticides, fungicides, weed killers and liquid fertilizers. Operates from water pressure from ordinary hose connection.

Offers easiest way in the world to apply crabgrass killer.

Operating time is from 14 to 36 minutes, depending upon the amount of pressure used.

One quart of concentrate "HOZZER CIDE" sufficient to spray up to a half acre.

Complete instructions given on labels of spray material holders.

Apparatus weighs only eleven pounds, and may be installed in approximately two minutes. Simply drive stake into ground near water outlet, place the BUGHOZZER on stake, connect its hose to spigot and fasten garden hose to bottom. When cylinder is filled with toxicant, the concentrate is mixed properly with flowing water.

ACCURATE TOOL CO.

(Insecticide Section)

15 Manufacturers Place — Newark 5, N. J.

DEALER AND SALES REPRESENTATIVES WRITE FOR INFORMATION

Better fly protection for dairy cattle

Thanks to U.S.I. research, dairy cattle are getting better fly protection than ever before attainable when they're treated with **Pyrenone-type* sprays — oil base or water emulsion.

Pyrenone-based sprays effectively control not only horn flies, but stable flies, tabanids, and deer flies as well. Used in milk rooms or other parts of the dairy, farm, or ranch buildings they kill roaches, cheese mites, ants, silverfish, and a wide variety of other insects.

What's more, Pyrenones are recognized as non-hazardous. Properly formulated sprays based on Pyrenones are equally safe.

Pyrenone-type sprays offer the dairyman maximum dairy insect control at reasonable cost — and provide both manufacturers and distributors with attractive profits.

Your nearest U.S.I. office will gladly furnish further details.

*Pyrenone is a registered trade-mark of U.S.I. It designates combinations of Pyrethrins and Piperonyl Butoxide.

U.S.I INDUSTRIAL CHEMICALS, INC.

60 East 42nd Street, New York 17, N. Y.

Branches in all principal cities

In Canada: Standard Chemical Co., Ltd., 99 Vanderhoof Avenue, Leaside, Toronto 17, Ontario.